A FAWCETT PUBLICATION

JUNE 25c
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MODERN MECHANICS AND INVENTIONS

ELECTRIC CANNON USES NO GUN POWDER
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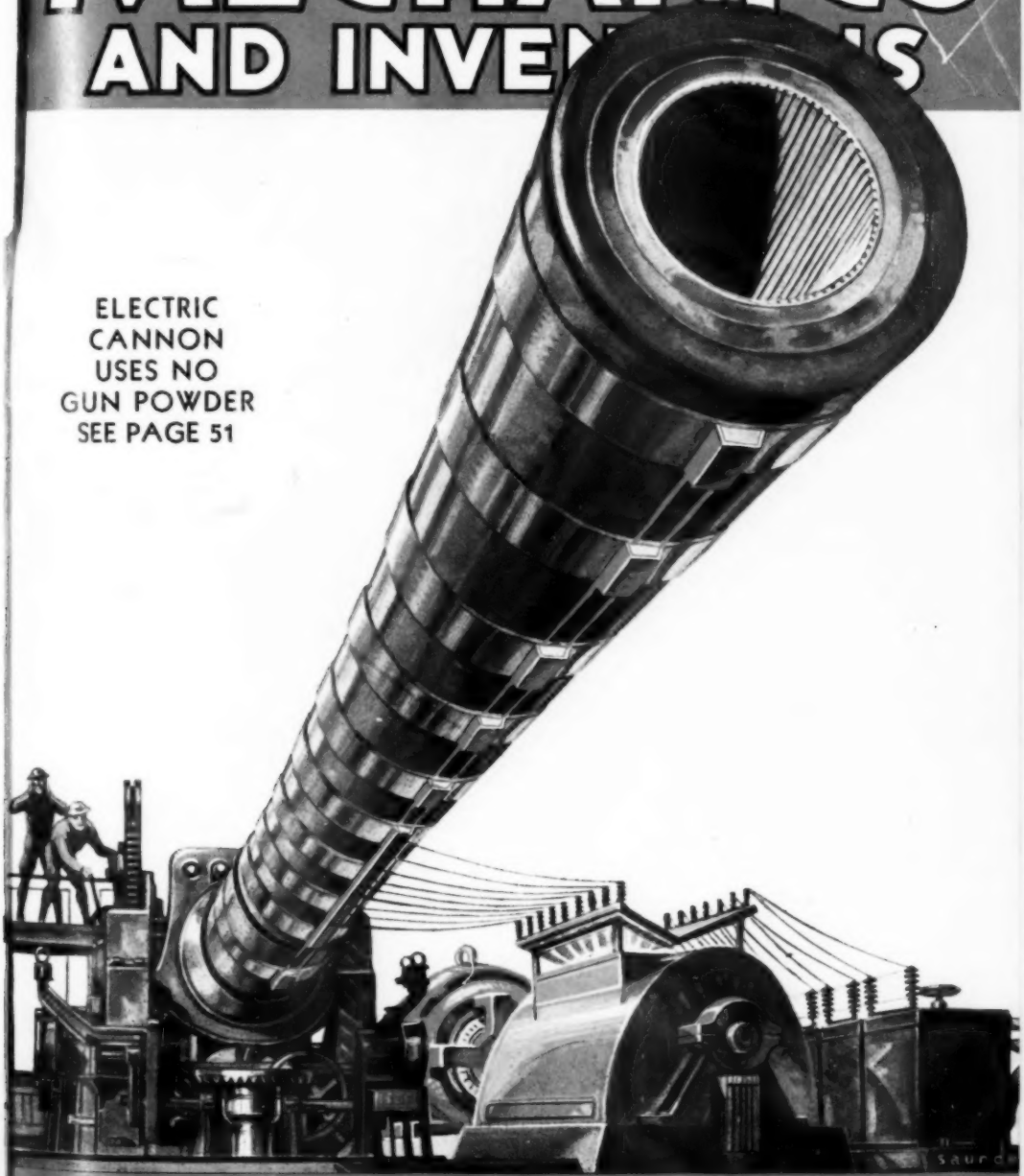

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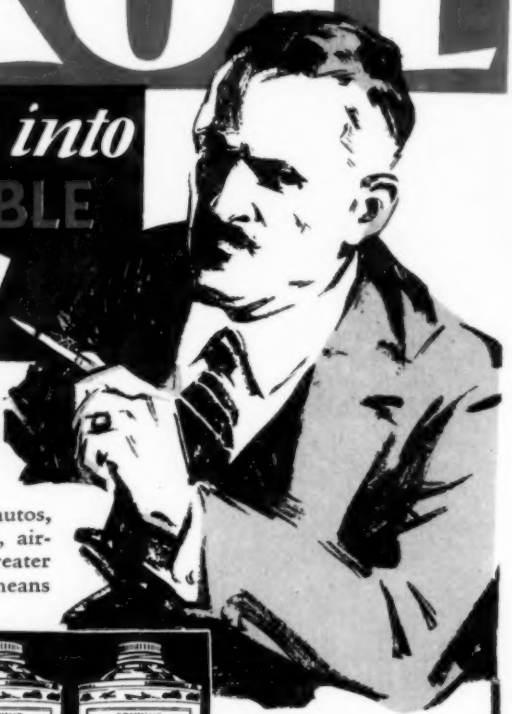

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NUMBER 2

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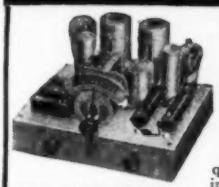

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Find out what Radio offers. Mail the coupon below for my free book, "Rich Rewards in Radio." There are over 16,000,000 Radio receiving sets in the homes of this country. Several million new sets are sold every year. What an opportunity for the trained service man to keep working steadily at good pay servicing and installing sets! Over 24,000,000 automobiles on our roads—and only 2 per cent have Radios installed. What a chance for sales and service profits, selling and installing automobile Radios!

No wonder many of my students are making up to $60 and some as much as $100 a week working for retailers, wholesalers, and manufacturers! No wonder others are making even bigger money in businesses of their own. No wonder many are making $10, $15, $20 a week in their spare time after working hours.

New Developments Promise Bigger Opportunities

Short Wave Broadcasting is creating a demand for short wave sets. Aviation is using Radio more than ever. Television is another coming field of great opportunity. Trained Men will be needed by the hundreds to install, service, and sell Television sets. All of these subjects and many others are covered by my course.

Many Radio Experts Make $50 to $100 a Week

In about ten years the Radio Industry has grown from $2,000,000 to hundreds of millions of dollars. Over 300,000 jobs have been created by this growth, and thousands more will be created by its continued development. Many men and young men with the right training—the kind of training I give you in the N.R.I. Course—have stepped into Radio at two and three times their former salaries.

Many N.R.I. Men Have Made $200 to $1,000 in spare time while learning

The day you enroll I send you material which you should master quickly for doing 28 jobs, common in almost every neighborhood, for spare time money. Throughout your course I send you information on servicing popular makes of sets; I give you the plans and ideas that have made $200 to $1,000 for N.R.I. students in their spare time while studying. My course is famous as the course that pays for itself.

64-Page Book of Information FREE

Get your copy today. It tells you where Radio's good jobs are, what they pay, tells you about my course, what others who have taken it are doing and making. Find out what Radio offers you and what my Employment Department does to help you after you graduate. I am so sure I can train you satisfactorily that I agree in writing to refund every penny of your tuition if you are not satisfied with my Lesson and Instruction Service upon completion. ACT NOW!

Act Now

These Men Licked the Depression

"I have a steadily increasing business, January, 1932, showing receipts more than double those of January, 1931. My three best evenings for straight service work were $27.50, $22.00, and $21.50, respectively." GEORGE A. TURNER, 211 Polk St., Pueblo, Colorado. February 26, 1932.

"I have established myself in Beckley and am enjoying a marvelous business. In September, 1931, I opened my repair shop with no capital. Since then, my receipts are $2,832.75 up to the first of the year, and business is increasing daily." ROBERT P. BRANHAN, Allen Building, Beckley, W. Va. Jan. 11, 1932.

"I have the most modern and up-to-date shop in southern Illinois, and my books show an increase in business for 1932 over the same period last year. The National Radio Institute has pulled me out of the mines and shown me a better standard of living." R. P. LAMPLEY, 1100 County Road, Benton, Illinois. January 25, 1932.

Mail Coupon Today

J. E. SMITH, President
National Radio Institute, Dept. 2FH
Washington, D. C.

Dear Mr. Smith: Send me your book, "Rich Rewards in Radio." I understand this places me under no obligation and that no salesman will call.

NAME.....

ADDRESS.....

CITY.....STATE.....

Employment Service to all Graduates

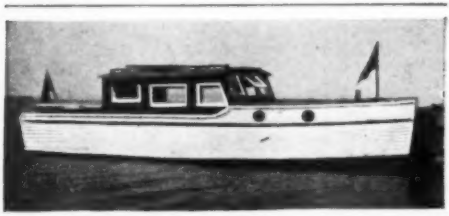
Here's Allen Slene's mighty Maytag motor car, built from coaster wagon parts and the business department of a Maytag washing machine. No figures on speed are available for the fans who are interested in miniature moter wagens, but Andy suspects the belt-tension clutch and Rolls-Rough springs are salient features.

Andy's Shop Mail Box

Deservedly the most popular of magazine columns, Andy's grease-slinging line opens the door to more readers this issue than ever before. Maybe your letter is here, brother monk. Look and see!

HUMP ta diddy, gang! All us chillun got wings these days—to paraphrase an old Negro singin' tune. It sure be grand for spring to be in such full blast.

Last issue we haa the annual Spring Growl. Now with all the ball teams in full action, all the swell things come to pass that I predicted would happen, this fine morning comes around with song in the air for old Andy to unwind himself from his cot in the hangar and write youse guys.



Hailing from Port Arthur, Ontario, this dandy little cruiser is a citizen of the fresh water sea. Built by M-M reader.

What a day! All predictions of last issue come true, too. You know: robins warblin' and birds singing, big red bashful morning 'sun, larks out on the tarmac and worms in the 'sod under 'em, and such. And Slide Rule Sam out early (taking advantage of breathless morning stillness) warming up his new cloud buster with one of the new Packmag Cross Country mills blaspheming the sanctity of the dewy morning atmosphere. Just like old days at Issoudun. Nothing different except the size of the field and the knowledge that Sam will come down whole and go up again, and that there's no Top Kick to come in 5½ seconds after reveille kicking me out of the downy.

Lemme take time out for putting on my shoes and rubbing my whiskers and I'll reach into the batch of letters I've carted out here from the office, which letters are those as I figgered should make this monthly column of pied type.

Everything has to have a beginning I guess. So I might as well begin right here in the middle. Have had the feeling that some of you brother monks felt throttled, so all letters

(Continued on page 12)

"Gentlemen, my Son!"

. . . and how do they look at him . . . what do they think of him?

Business men are quick to judge character! They know that no man succeeds beyond the limitations of his own spirit. No man controls others who cannot control himself. No man leads in the long run, who has not first learned to follow. No man can so well give orders as he who knows how to take and execute them.

Whatever your son is to be, he must raise the structure of his training on the foundation of character. It is our business to teach aviation. . . . but we place more emphasis on building character than on building airplanes or flying them. Our first responsibility is to make sure that a student is a *man*, in the fullest and best sense of the word. Not all meet that specification when they come to us . . . but those who graduate are *men* with background, force, self-reliance and ability.

SUCH MEN *succeed* IN AVIATION!

Men with such training gain instant recognition when the chance for advancement comes. In the aviation industry the quality of PARKS graduates is an accepted standard, proved in actual performance time and again. So rapidly is aviation expanding that a capable man finds promotion ready for him years earlier than in older industries. Nowhere else is merit so quickly rewarded! What does that mean to your son? It means that Parks training offers him the best possible start toward the goal he has chosen. When you approve his decision to come to Parks Air College, you do a big thing for him . . . the best thing that can be done for any young man who is making aviation his career!

You are invited to visit and inspect **PARKS AIR COLLEGE**

PARKS AIR COLLEGE
WORLD'S LARGEST COMMERCIAL FLYING SCHOOL

Section 6-MM
East St. Louis, Illinois.

If you cannot come to the school, this New 1932 Edition of "Skyward Ho!" will tell you much about PARKS standards and methods. It describes all our courses in detail, with many illustrations. Sent on request.

MAIL THIS COUPON

Send me "Skyward Ho!", with information about the course checked, for a young man of_____ Age

- ☐ Executive Transport Pilots' Course
- ☐ Transport Pilots' Course
- ☐ 28-week Executive Aviation Course
- ☐ Limited Commercial Pilots' Course
- ☐ Airplane and Engine Mechanics' Courses

Name _____

Address _____

City _____ State _____

INVENTORS

Let me send you my...

FREE Book about PATENTS

PROTECT the future profits from your idea by securing a United States Patent. Your first move is to communicate with a Competent, Registered Patent Attorney, and learn the essential FACTS about patents without a day's delay. My Free Book gives you these vital facts—HOW TO PROCEED—different kinds of patents—government fees—importance of protection and much more.

Read These Important Facts

Every year thousands of applications are filed in the U. S. Patent Office, and many conflicts arise due to applications being filed for substantially the same invention by two or more different inventors. IN SUCH A CASE THE BURDEN OF PROOF RESTS ON THE MAN WHO FILES HIS APPLICATION LAST. A most important element in success, therefore, is prompt action. Send for my FREE BOOK today. I will also mail you my valuable "Record of Invention" form on which to sketch or describe your idea. This may prove very useful as evidence later on.

MY WASHINGTON LOCATION

My offices are within five minutes' walking distance of the U. S. Patent Office. This makes it very convenient for me to refer to the files of the Patent Office or confer with the officials, when the necessity arises. Consider this fact in selecting your attorney.

Strictest Secrecy in My Office

I am prepared to handle your patent matters in a careful, satisfactory and efficient manner. I give you personal attention. In my office all correspondence, sketches and models are kept in strict secrecy, so that you can write me in perfect confidence. Your first move is to mail the coupon AT ONCE!

MAIL TO WASHINGTON

L. EDWARD FLAHERTY,
Registered Patent Attorney
722 International Building, Washington, D. C.

Please send me by return mail your Free Book "How to Get a Patent" and include, also free, your "Record of Invention" form.

Name .....

Address .....

City ..... State .....

ANDY'S SHOP MAIL BOX

(Continued from page 10)

which have made the column this month come off the spindle and into your hands as I puff my pre-breakfast 'baccy and punch and poke this colyum together, the while looking out through the expansive hangar doors into a morning scene fit to bring tears to the hardest hearted of mothers-in-law.

So.—Says Doc Wilkinson, up in Port Arthur, Ontario, where 500 foot steamers come and go with clocklike regularity all season:

273 Lincoln St.,
Port Arthur, Ont.

Dear Andy:

As an old reader of your wonderful mag I would say she is O. K. in large type. Have read it since it was first published, at least I think so, and in building our boat your mag was a wonderful help.

I designed her myself and my brother and I built her and is she built well? After two seasons of use on Lake Superior in all kinds of weather she is still as sound as ever. That is a pretty good test. And I don't mean calm weather. Many times we all have looked through solid water on the forward deck. Well, I don't wish to take up your time. Put me down as one of the gang. And P. S. Have built motor sleighs, 10 all told, motor ice boats and air propelled ice and water craft, and won't see 40 again.

Sincerely,
DOC WILKINSON.

This rambling hombre who risks his right eye peeking into things each month for the Gang submits that if anyone ever deserved to belong, Doc does.

Probably it's vanity that prompts me to mention that I've been in Port Arthur too. And big seas and cold water must mean nothing to a boat if she lives up there. How's the "Islet Prince" and Capt. Fader and the S. S. "Rapids Queen," Doc? Of all the ports I've been in, Arthur is as pretty as any. And i&5 the—say, the P'fessor just strafed the wind sock over head!

He opened the Cross Country up just as he zoomed her and it startled me a bit. Sam'll kill hisself yet, though I don't see how he can do it with that motor and that ship unless he flies into a brick house. Look at that baby climb!

And if you gents who have been griped (the boss told me to say 'piqued' instead, but I don't know how to spell it) by light airplanes predominating this colyum will please pardon it, I am going to present the letter and photos from M-M reader Jim Schafer, first because it has made the column, and second because it is next on the spindle:

Dear Andy:

It's kind o' hard to take back something you have said or written but I still have a way around this one. I have been trying for quite some time to make a motorcycle motor

(Continued on page 14)

Learn All About Autos AT McSWEENY'S

Just A Few Weeks To Prepare For A Big Pay Job

NOW is the time to learn a trade that will insure your future, that will make you independent of hard times, that will put you on the ladder of success—to climb to any heights of big earnings—limited only to the extent of your ambitions. Get into the nation's biggest industry where there are more opportunities than trained men to fill them. Learn autos at McSweeny's—all about them—in just a few short weeks—a trade that will never be replaced by mechanical equipment. Learn the practical end of the business—the end that made men like Ford and Chrysler, leaders of the industry. With 25 million autos on the roads of the nation—everyone needing service and repair—the demand for trained, highly skilled, auto experts is greater than ever. It's all made easy and quick for you at McSweeny's. It's the sure way to a business of your own.

Hundreds of McSweeny trained men own successful Auto Agencies and Service Garages—are independent, happy, prosperous. Plenty of opportunities open—if you want a business of your own. McSweeny training includes management of businesses like this.

Learn by Doing No Books—No Lessons

You get practical, individual, shop-work training at the McSweeny school. No books to read—no dry lectures to listen to. You work on real equipment, with real tools. You do the actual work in each branch of the trade, with expert instructors at your elbow to guide you, show you how to do the job right. **No previous experience needed . . .** just a liking for mechanics and ambition for success . . . and you are assured of a prosperous future. 50,000 McSweeny trained men attest to the advantage of McSweeny training.

Money Back Guarantee

If, after completing my training, you are not satisfied, if you are not qualified to accept a big-pay job, your tuition will be refunded. You take no risk—no chances.

TRAIN FOR THESE JOBS

McSweeny training fits you for these positions. Jobs waiting in the auto business for men who know.

- **General Auto Mechanics**
- **Garage Managers**
- **Bus and Auto Transportation Experts**
- **Service Station Owners and Operators**
- **New and Used Car Dealers and Salesmen**
- **Trouble Shooters**
- **Auto Electrical Experts**
- **Battery Service Men and Station Owners**
- **Bus Drivers and Mechanics**
- **Tractor Operators and Service Men**
- **Aviation Motor Mechanics**

SPECIAL TUITION OFFER

Right now I have a surprise offer that makes it amazingly easy for you to get this training. It's your one big chance to get out of the low pay rut into a trade that can bring you big money and independence. Write me now. I'll send you all particulars of the most sensational school offer ever made in America—an offer that makes it possible for any man anywhere to get this training.

Big Auto Book FREE

My big auto book brings you all the particulars of this great school—shows you every step in the training that starts you on the road to become an expert in this greatest of trades. Just send your name and address or mail the coupon. My surprise tuition offer will be mailed with catalog. Don't wait—offer limited—WRITE NOW!

McSWEENY SCHOOL
CLEVELAND, OHIO

Mail This Coupon for FREE Book

J. H. McSweeny, Pres.
Dept. A-11-6, Chester at 30th St., Cleveland, Ohio

Without cost or obligation, send me your big **FREE** book on **AUTO MECHANICS** and full details of your Special Low Tuition and Surprise Offer.

Name.....

Street.....

Town.....State.....Age.....

"A correspondence course? —YES and be sure it's I. C. S."

"IF A MAN is going to get ahead these days, he must continually acquire more training — and the only *time* he can do this is in spare time. And the only *way* he can do it is by studying a correspondence course.

"But don't start if you haven't the determination to go through with it. *Spare-time study is not a business for weaklings.* It takes courage — and work! But remember this, completion of a course will pay dividends the rest of your life!

"But don't fake any chances. Once I faced the problem you now face — and I enrolled with the International Correspondence Schools. My choice was a wise one. I recommend I. C. S. to you!"

Every day, all over the world, thoughtful employers recommend I. C. S. training to ambitious employees. They have not forgotten what spare-time study did in shaping their careers. And when you mark and mail this coupon, you follow in the path they have blazed. Why not do it—today?

INTERNATIONAL CORRESPONDENCE SCHOOLS

"The Universal University" Box 2320-Q, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Automobile Mechanic
☐ Architectural Draftsman	☐ Plumbing ☐ Steam Fitting
☐ Building Estimating	☐ Heating ☐ Ventilation
☐ Wood Millworking	☐ Sheet Metal Worker
☐ Contractor and Builder	☐ Steam Engineer
☐ Structural Draftsman	☐ Steam Electric Engineer
☐ Structural Engineer	☐ Civil Engineer
☐ Electric Wiring	☐ Surveying and Mapping
☐ Electrical Engineer	☐ Refrigeration
☐ Electric Lighting	☐ R. R. Locomotives
☐ Welding, Electric and Gas	☐ R. R. Section Foreman
☐ Reading Shop Blueprints	☐ R. R. Bridge and Building Foreman
☐ Telegraph Engineer	☐ Air Brakes ☐ Train Operation
☐ Telephone Work	☐ Highway Engineering
☐ Mechanical Engineer	☐ Chemistry ☐ Pharmacy
☐ Mechanical Draftsman	☐ Coal Mining Engineer
☐ Machinist ☐ Toolmaker	☐ Navigation ☐ Boilermaker
☐ Patternmaker	☐ Textile Overseer or Supt.
☐ Pipefitter ☐ Tinsmith	☐ Cotton Manufacturing
☐ Bridge Engineer	☐ Woolen Manufacturing
☐ Bridge and Building Foreman	☐ Agriculture ☐ Fruit Growing
☐ Gas Engines ☐ Diesel Engines	☐ Poultry Farming ☐ Radio
☐ Aviation Engines	☐ Marine Engineer

BUSINESS TRAINING COURSES

☐ Business Management	☐ Business Correspondence
☐ Office Management	☐ Lettering Show Cards ☐ Signs
☐ Industrial Management	☐ Stenography and Typing
☐ Personnel Management	☐ Complete Commercial
☐ Traffic Management	☐ Civil Service ☐ Mail Carrier
☐ Accountancy ☐ Cost Accountant	☐ Railway Mail Clerk
☐ C. P. Accountant	☐ Grade School Subjects
☐ Bookkeeping	☐ High School Subjects
☐ Secretarial Work	☐ College Preparatory
☐ Spanish ☐ French	☐ Illustrating ☐ Cartooning
☐ Salesmanship ☐ Advertising	☐ Lumber Dealer

Name..... Age.....

Address.....

City..... State.....

Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

ANDY'S SHOP MAIL BOX

(Continued from page 12)

Jim Schafer of Covington, Ky., built himself this Blue Grass lawnmower out of Waco Glider parts and a cleverly souped up chain-reduction Henderson motor.

lift a glider but as you will see by the enclosed newspaper clipping the feat has been accomplished.

You will no doubt remember some time back I wrote the Gang saying it could not be done and that I had tried it and failed. Well the motor in the enclosed clipping is not in any sense a motorcycle motor any more as I have changed the pistons, cut off part of the crankcase, changed the manifolds and carbureter, increased crankcase ventilation and what not. But to get down to flying will say that she really gets off the ground and right now. Real quick.

It might be interesting to know that the motor mount and front fuselage assembly was built fourteen miles from the wings and other parts and when assembled fit perfectly and made a successful flight the first time it was rolled out upon the field. All measurements being correct and point of pressure and center of lift all perfect. "Ain't that Somethin'." Well anyway I am flying it and she sure flies and will keep level on half throttle.

Any information you might need on this will be gladly handed on. If not interested just heave into the waste basket.

Thanking you for past favors,

I remain very truly,

JAMES F. SCHAFER.

Then later came this letter with photos:

Dear Andy:

I have had some difficulty in getting a good picture of my powered glider since the newspaper man shot the pictures I mailed you in January, but you can look them over and

(Continued on page 16)

Make this amazing test.. yourself!

Now! You can prove to yourself how easy it is to solder aluminum or any other metal.

Along with your kit of Alumaweld, we will send you two small sheets of aluminum. Lap these together as shown in the above drawing. Place a small amount of Alumaweld solder and flux along the lap. Then hold over a flame.

In less than ten seconds the flux will boil and smoke and the two pieces will be welded together.

Try and pull them apart. Use your hands . . . then pliers. You will tear the aluminum to shreds, but you will not be able to tear the joint.

Imagine what this means! You have welded aluminum without an acetylene torch—at a temperature of 370 degrees F. In this same, simple way, you can handle any metal used today!

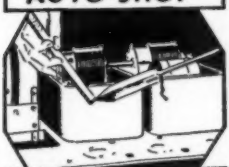
Alumaweld all metal solder will solder any metal, including aluminum, pewter, die castings, cast iron and steel. It is regarded as the most revolutionary discovery in an age. Over 200 trade magazines have described this solder in their columns. The very largest concerns in the country are numbered among its users. And the product is less than six months old!

At Last! Aluminum can be soldered!
ALUMAWELD ALL METAL SOLDER
will repair any metal.
ALUMINUM · POT METAL
STEEL · CAST IRON *etc*
Ten Times as strong as ordinary solder!

In your home workshop—your repair shop—or factory—Alumaweld will save time and money. It is applied with an ordinary soldering iron or blow torch—so simply that anyone can use it. Its strength is over ten times that of ordinary solder. It is a real ALL METAL SOLDER—FOR ANY JOB!

Take advantage of our get acquainted offer and send for the special dollar kit of Alumaweld today. Make the welding test. If you are not entirely satisfied—for any reason whatsoever—we will refund your money. Our big dollar kit contains seven good-sized sticks of Alumaweld solder, one bottle of Alumaweld flux, one tempered steel cleaning brush, two pieces of sheet aluminum for test purposes, and complete, EASILY FOLLOWED directions. Use the coupon . . . today!

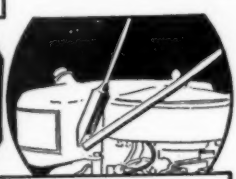
AUTO SHOP



RADIO WORK

FARM USES

PIPE REPAIRS



MARINE

AGENTS! DEALERS! MAKE BIG MONEY SELLING ALUMAWELD

Get in on the ground floor. Our agents are making up to $30 a day selling Alumaweld. Be your own boss. Every home, factory and repair shop NEEDS Alumaweld. It sells on sight . . . 100% profit to you. Send $1.00 for a complete kit. Try it out. If you MEAN BUSINESS, we will grant you territory . . . give you leads from our advertising . . . and circulars for distribution. Don't delay. Alumaweld franchises are VALUABLE. They'll go FAST! Mail the coupon . . . TODAY!

Alumaweld REPAIRS

Crank cases, burst water jackets, vacuum cleaners, washing machines, radio sets, auto bodies, farm implements, pots and pans, aeroplane engines, outboard motors, steam radiators, water pipes and steam pipes, and all general machine shop or sheet metal repair.

It will repair ANY METAL easily, perfectly and lastingly.

ALUMAWELD COMPANY, Dept. 1-B,
710 E. Broadway, Glendale, Calif.

Gentlemen: Mail me immediately a complete kit of Alumaweld, containing seven good-sized sticks of solder, a bottle of flux, a tempered steel cleaning brush, two aluminum strips for test purposes, and complete, easily followed directions, for which I am enclosing one dollar. If, for any reason, I am not satisfied, you agree to refund my money—without question.

☐ Check here if you want agent's proposition.

Name .....

Address .....

Town and State .....

Men Needed NOW!

Earn up to $125.00 a week in this Fascinating New Field!

4 to 6 Hours Work a Day

You've seen how men who got into the automotive, electrical and aviation industries, when they were uncrowded, have doubled and tripled their earning power. NOW—the same golden opportunity is offered to YOU, in a brand new, fascinating field, Sound Motion Picture Operating! More than 5000 theaters in the United States still to be wired for sound—more than 10,000 trained men needed to operate this delicate sound equipment, and new theaters building every month! MEN—here is a real chance to get out of a dull, hopeless job and step into the big pay field with only 4 to 6 hours of entertaining work a day, 52 weeks of the year—no layoffs or salary cuts, and a genuine future ahead!

Quickly Train Yourself With C. O. T. A.

The California Operator's Training Association is situated in the capital of the Motion Picture Industry, Los Angeles. It has successfully trained men in all parts of the world to qualify as Expert Operators in leading theaters. The C.O.T.A. is the only training division of any labor organization in the world serving this field. This means full protection for YOU while you are learning, and after you graduate and become an Expert Operator. Right in your own home, during spare time, The C.O.T.A. will quickly prepare you for actual work on the latest RCA and Western Electric Sound Equipment. Previous experience unnecessary.

Low Tuition Cost With Special Offer

The C.O.T.A. is so positive it can successfully train ambitious men for this well-paid field, you need only pay less than half of the low tuition cost—pay the rest after you are making money as an Expert Operator. This offer for a limited time only!

Mail Coupon for FREE BOOK

Get all the facts! Learn what others have done. Read the complete details of C.O.T.A. Training and our SPECIAL OFFER. Write today!

California Operator's Training School, Dept. A4,
103 North Rowan Ave., Los Angeles, Calif.
Send me full details of your Sound Motion Picture Operator's training and details of Special Offer.

Name .....

Address .....
(Write or Print Plainly)

ANDY'S SHOP MAIL BOX

(Continued from page 14)

the ones you cannot use please return to me and if you cannot use any of them I will try to get a better one later on.

This is a regular N. A. Z. WACO Glider, the front and center section being rebuilt to accommodate the four cylinder motor. The prop mount as well as motor mount is welded in chrome aircraft tubing as is the landing gear using two WACO tail wheel tires 10x3 which work very nicely. It is very important to get all the weight where it should be as well as the center of pressure and gravity.

This little craft flies very nicely and really would surprise you the way it gets off the ground. Just give her the gun, the tail flies into the air immediately and down the field she goes. Just give the stick a slight pull back and she is off. After clearance of trees and etc. is reached throttle back some and you sure have a lovely ride in the air and landing is where she sure shows the big ships up.

She will come in to a perfectly flat landing and as slow as you like. Some pilots told me they thought it could be landed five miles per hr., but I would say about fifteen miles per hr. It will take off in less distance than the Aeronca that is being flown from the same field.

The motor base holds three qts. of oil and the present gas tank holds two gals. of gasoline.

Any information on this ship will be gladly handed out so if anyone should write please enclose postage.

Thanking you I am very truly,
JAMES F. SCHAFER.
29 East 16th St.,
Covington, Ky.

Thanks, Jamey. The line forms on the right. And for the love of mike, lads, if you write any of the gang who are energetic enough and generous enough to give you dope on their accomplishments, be sport enough to include return postage. One designer of a M-M boat has spent fifty hours answering fifty builders fifty sane questions concerning the matter of Dorothy, which fifty men are building. (No hokum this.)

You'll have to admit that Schafer is a sport for eating his own Crow. Something about these boys in the air that makes 'em all brothers under the skin. Maybe it's courage, maybe it's ambition—I dunno. If they're anything like Sambo-Ambo Wing they have no respect for airplane-flesh. Sam's aloft about a mile and a half to the south now and flip-flopping all over the sky. I bet his control wires are groaning. And here I sit in comfort, perched on the edge of my cot, pecking the Woodstock in security while Sam rips clouds to pieces. Pardon me while I yawn. The sun climbs higher. I ought to put my shoes on. Drafty on my socks.

(Pause for yawn.)

(Continued on page 20)

RAILWAY POSTAL CLERKS

$158 Month First Year; Raise to $225 Month

Many Other U. S. Government Jobs Open to Men and Boys 18 to 50

Post Office Clerks—City Mail Carriers—Rural Mail Carriers—Clerks—Customs and Internal Revenue Service Customs Inspectors—Immigrant Inspectors—Prohibition Agents

These are steady positions. Strikes, poor business conditions, lockouts or politics do not affect them. U. S. Government employees get their pay for full twelve months every year. There is no such thing as "Hard Times" in the U. S. Government Service.

ALLOWANCE FOR HOTEL EXPENSES

Railway Postal Clerks now get $1900 the first year, being paid on the first and fifteenth of each month, $79.16 each pay day. Their pay is increased $100 and $150 a year. The maximum is $2700 a year, $112.50 each pay day. They get extra allowance for hotel expenses when away from home.

PAID VACATIONS

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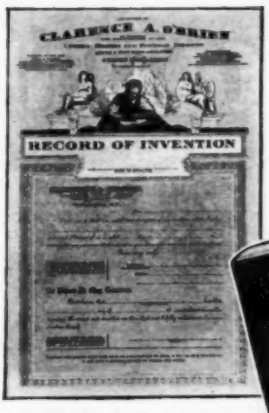

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Registered Patent Attorney

WASHINGTON

D. C.

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TENTS

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ANDY'S SHOP MAIL BOX

(Continued from page 16)

Bill Towlson of Ware, Chassamusetts, puts on this spring bonnet to make him feel well, and then he goes down to the sea to see what he can see. Here's one time that the frau could play a dirty trick by leaving the pump!

Down in Chusamassets an old water boiler has gone to sea to see what it can see. Writes Wm. Towlson:

In the last February issue of the M.M. the Shop Mail printed a letter from Edwin (Ike) Schultz about his diving equipment. Well, after reading his letter we thought we ought to write in a letter about our experiences with the diving equipment, which we made from M.M. plans. So here it is:

Like Ervin and his friend, we obtained an old hot water boiler and cut the shape of it out with an old chisel. This was slow work, but we finally succeeded in finishing it with only one broken thumb-nail.

Next, we built up a frame to hold the glass and bolted it to the helmet. We then filled the cracks with roofing compound and set the glass in the frame.

We used a forty foot garden hose with connections on the helmet and on the pump box so that the hose is easily detachable when transporting.

For a pump we used four automobile tire pumps soldered to a piece of gas pipe and connected to the pump box. This pump box

(Continued on page 22)

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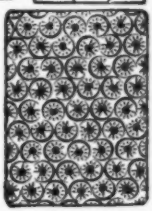

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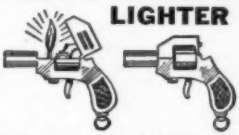

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If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

ANDY'S SHOP MAIL BOX

(Continued from page 20)

contains an ozone generator made of two pieces of screen (4"x4") separated by a sheet of paper so it will arc when current is turned on.

After trying it we found that a telephone would be a great asset, that the glass fogged when under water, and that a submarine light was needed when at a depth. So we set to work to improvise these improvements. First, we built a box the size and shape of a suitcase with a handle on the top for carrying our battery and spark coil (for ozone generator). One side of this case is used for switches and connections.

The telephone is simple and inexpensive. It is of the magnetic type consisting of two pairs of earphones, using half of the headset for a transmitter and the other for the receiver. One pair in the helmet and one wire is used and grounded completing the circuit to the control box on the shore where the operator has another pair. A battery in the hook up is controlled by a switch which can be turned when needed for better reception.

Next, we built up a small frame on the first one and placed another glass window (with about ¾" air space between them) over the first one. This stopped the fogging.

Later, we placed two bulbs (flashlight) between the glasses one in each top corner, wiring them up through the inside and up the outside of the helmet and up the hose to the control box, where it was connected to a switch and battery.

We would appreciate it if some other fans would write to us about diving and their apparatus.

Signing off,

WILLIAM A. TOWLSON.
PAUL MEZIER.

One of the most interesting things about running a big magazine is the way in which things come home to roost like the diving helmet Towlson and Mezier have built.

We run a how to build article. A lot of mail comes in concerning it, and sure enough, from six months to two years later in come the shots showing just how some reader interpreted the plans and how the thing worked out.

Invariably the successful ones are the men who build exactly as the plans are published. Towlson and Mezier are to be congratulated on their unusually interesting interpretation of the diving helmet how to build, which is one of the most popular metal working designs we've ever run.

To please the boat bugs come this one from Leroy F. Norton, Presque Isle, Maine:

Dear Andy:

Have been intending to drop you a line for a long time to tell you that Modern Mechanics and Inventions is far ahead of other mags of a similar nature. Used to take several but have now narrowed down to M.M. (This may be

(Continued on page 24)

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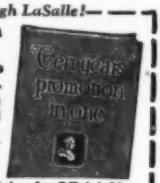

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Address.....

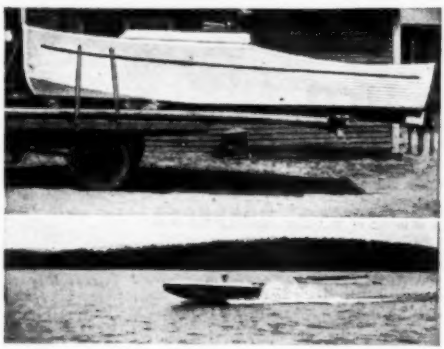
ANDY'S SHOP MAIL BOX

(Continued from page 22)

partly due to the present depression, of course.) Am enclosing a few little shots of some boats I have built from M.M. plans except 1, the little racer, built from another mag. Note the action shot of Miss Modern Mechanics, powered with a 20. Built this boat the winter of 1929-30, and Allegra last winter. She sure is a sweet boat, attracted much attention last summer.

Am also much interested in your plane plans. Let's have more of both boats and planes.

Yours truly, LEROY F. NORTON.



Allegra herself—an M-M design built exactly to the plans by Leroy Norton of Presque Isle, Maine. Below, the hydroplane "Miss Modern Mechanics," built by the same reader.

Looks like we're the faces that launched a thousand ships. Thank Heaven they're good ones.

SEND IN YOUR PICTURES

Incidentally, another phase of this phenomenon of reader reaction lies in the fact that we never know how many of a certain design boat and airplane or how-to are built. Some readers lack news sense (or do they have a false modesty?) which would ordinarily dictate the sending in of shots of their projects. So we can only estimate from the mail actually in our hands what has been done.

* * *

Looks like the latest and best piece of magic has been copped by the Mechanical Package Magazine, whose activities are pretty closely linked up with M-M's.

This coup is the publication of the whys and wherefores in the design of the Packmag 40 h.p. Cross Country Twin.

Parts can be had very reasonably and an Approved Type engineered engine can be made for about the cost of the model A conversion on half the weight.

And right now there she is on the snoot of Sam's Air Camper scuttling in for a landing. Hold her off boy! Hold her o-o-o-ff! There! Easy as a dandelion seed, and a pretty three point.

(Continued on page 28)

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(Continued on page 28)

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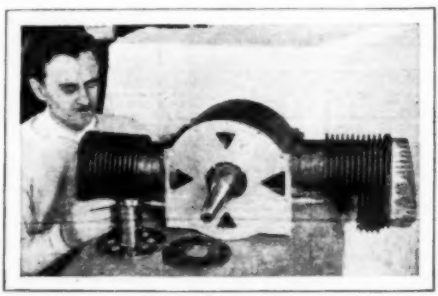
(Continued from page 24)



The Packmag Cross Country Twin in process of assembly.

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(Continued on page 30)

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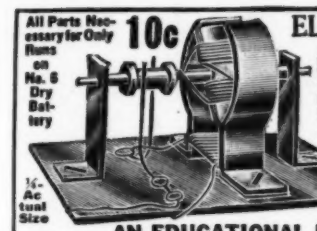

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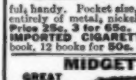

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A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. **Price 10c, 3 for 25c.**

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Well made and effective, modelled on latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard .22 Cal. Blank Cartridges—obtainable everywhere. Special cash with order offer: 1 Superior quality Blank Cartridge Pistol, 100 Blank Cartridges, and our 770 page De Luxe Catalog of latest novelties; all for **ONLY $1.50.** Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges **50c** per **100c.**

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Into a trunk, under the bed or anywhere. Lots of fun fooling the teacher, policeman or friends.

THE VENTRILO

a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. **Never fails.**

A 16 page course on Ventriloquism, the Ventrilo and 770 p. novelty catalog, ALL FOR 10c.

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COMBINES ALL THE POWER AND DEFINITION OF THE MORE EXPENSIVE MICROSCOPE

SURPRISINGLY GREAT MAGNIFYING POWER

EXAMINE GERMS IN WATER, CHEESE, SUGAR, ETC.

There are few things so interesting and valuable as a Microscope. It enables you to minutely examine mineral animal and vegetable specimens, to test cotton, wool, silk, seeds, water, flour, cheese, milk, and in fact nearly all articles of food. Unwholesome meat can be readily detected and ferments can be closely watched. It is exceedingly interesting to examine the spores of ferns, soda, sugar, salt, alum and other crystals, the dust (scales) from moth and butterfly wings, human hairs, flies and insects, while the animalcule in water are a never-failing source of wonder. Most interesting experiments can be performed with an instrument such as this. Place a piece of cheese in a box and allow insects to feed on it for a day or two. Then examine a tiny portion of the cheese under the Microscope and you will see little animal bodies, magnified to the size of large beetles; you can count their legs and the joints in them, the talons or claws upon each foot, also the hair or bristles upon their bodies. Or, obtain some stagnant water; deposit a small portion of scum upon the object glass of the Microscope with a pin's head, and you will see beautiful animalcules swimming about with as much freedom as though they were fish in the boundless ocean. It is a truly wonderful sight and an endless source of interest and enjoyment for everybody. The Microscope is made of brass and is capable of magnifying 300 times, and although small and compact, it will cover a very wide range of microscopic research. **PRICE ONLY 50c Postpaid.**

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Dept. 901 **RACINE, WIS.**

A copy of our 1932 CATALOG mailed on receipt of 10c., or the De Luxe Edition with cloth binding 25c. Bigger and better than ever. Only book of its kind in existence. Nearly 800 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in goods and plants, etc., unprocurable elsewhere. Remit by Coin, Money Order, Check or unused U. S. Postage Stamps, for all articles listed above.

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IMAGINE the surprise of your friends to discover a book with your name as author, right there on your library table! And then picture their astonishment when, upon opening the volume, they find the leaves glued together, and the center cut out to make room for a flask, cigarettes, candy, or what have you!

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AMONG MY SOUVENIRS — light gray fabrikoid de luxe binding. Order one for her, with her name as author, and use it as a novel carrier for your gift of jewelry, etc.

MY CANDY BOX—green fabrikoid, suitable for candy container. Put her name on as author.

Here's how

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I enclose $..... Please send me, postpaid, the following order. (Print name of Author.)

.....copies of **The Eye Opener**, by.....

.....copies of **Lady Nicotine's Lovers**, by.....

.....copies of **Among My Souvenirs**, by.....

.....copies of **My Candy Box**, by.....

Signed .....

Address .....

AGENTS WANTED — WRITE FOR PARTICULARS

ANDY'S SHOP MAIL BOX

(Continued from page 28)

For some time there has been an impression here that small baby cars cost a lot to build. This was due to an error in a letter which was written in longhand and which mentioned a two hundred dollar price in a manner to look like a coupla thou. Here's a light car letter from Ed. Borntraeger, who has really built a gem in his Silver Bullet; to save correspondence here's the works:

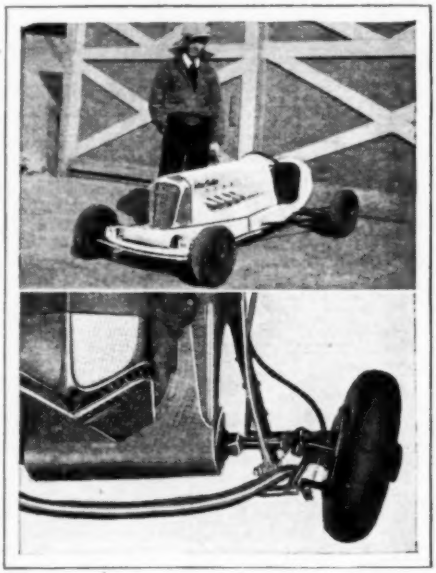
3433 N. Paulina St.,
Chicago, Ill.

Dear Andy:

In regards to your letter of March 17th, I will answer your last question first, in regards to whether I build this car for sale or sell blue prints on its construction. I only sell blue prints showing how to build it.

I am sending the only two good pictures which I have close up. One with the hood off and the other with the camera over the front wheel assembly. The only pictures I have of the car in its construction are very poor, but I also include one for you. The rest of this letter is for your approval or use in Andy's Shop Mail Box.

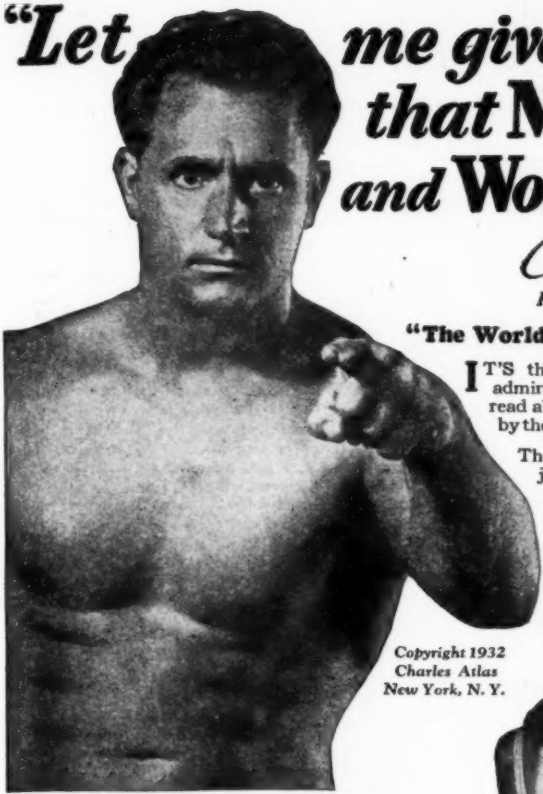
As I don't believe I have ever given you an idea as to "how or why" I built the "Silver Bullet," maybe I had better do so to make things clear to you. I did all the work in spare time, evenings, etc. I started in a very small space to build it with a small electric drill as my biggest piece of equipment and from start to fin-



Edw. Borntraeger, 3450 North Marshfield Ave., Chicago, built this perfect midget car, the Silver Bullet. Plans are available if you care to get in touch with Borntraeger. Note the car is a front wheel drive. See lower photo.

(Continued on page 32)

"Let me give you a Body that Men Respect and Women Admire!"



Charles Atlas

Holder of the Title:—

"The World's Most Perfectly Developed Man"

IT'S the most natural thing in the world—this admiration for a beautiful body. You've always read about the awe and respect in which it was held by the old Greeks and Romans. It's the same today!

The man who looks like a skinny, frail weakling just doesn't "get across." People don't give him a second glance. And—because he can't "get by" in a physical way—he doesn't go big in a popular way either.

He doesn't "register" with the men because they know they can rule him, without fear, if they want to. And the girls just don't admire and crowd around *any* fellow who evidently can't admire himself! *I* know, because I was a 97 pound weakling myself—UNTIL I discovered a method that twice enabled me to win the title, "The World's Most Perfectly Developed Man."

Copyright 1932 Charles Atlas New York, N. Y.

People are magnetically attracted by the fellow with a manly body. They can't help being "drawn to" him. He gets the center of the stage—becomes the most popular one in his crowd. Everyone looks up to him—wants to know him. Others "fade out" when he is around.

Remember summer is not far away. How will you look in a bathing suit?

"In Just 7 Days I'll Prove I Can Do It!"

I've helped thousands of men—young and old—underweight and overweight—weaklings and even "strong men" and other physical directors who wanted my kind of Muscle Power. Now I'll show *you* my quick, sure way to build yourself a new body and make "a new man" of yourself. I'll show *you* how to get the kind of body that every man respects and every woman admires!

It's easy my way—my secret of Dynamic-Tension does the work! You get the *proof* in your first seven days. In one week you begin to *see* and *feel* the difference in your bodily condition and physical appearance. Spending just a few minutes a day, doing what I tell you, without tricky apparatus, starving or gorging—using only my *natural* methods of Dynamic-Tension—you build up or reduce to the fighting trim that I am always in myself.

And besides getting this new muscle power and the strength and energy of an "Atlas Champion," my Dynamic-Tension method digs down into your system, banishing such conditions as constipation, pimples, skin blotches and the others that do you out of the good things and good times of life. Your new health, pep and vigor show even in your eyes, your hair and the way you carry yourself. If you're timid and bashful, you lose all that—you have a new, more forceful personality—you become a *new man!*

My *Free Book* tells what I've done for others and what I agree to do for you. Send for it—*today!*

FREE BOOK!

Send for a free copy of my large, illustrated book, "Everlasting Health and Strength." You'll get the stories of scores of other fellows and learn how I built myself up from a weak, no-muscle, always-tired "runt" to the powerfully evenly balanced figure that you see in my photos and that won for me my title "The World's Most Perfectly Developed Man."

Where shall I send YOUR FREE COPY? Don't put it off. Tear out my coupon, put it in an envelope and gamble a 2c stamp by mailing the coupon for the biggest prize that anyone can win—a handsome, healthy, husky body. I'm waiting to help you. Address:

CHARLES ATLAS, Dept. 6-V
133 E. 23rd St., New York City

CHARLES ATLAS, Dept. 6-V
133 East 23rd St., New York City

Dear Mr. Atlas: I want the proof that your system of Dynamic-Tension will make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book "Everlasting Health and Strength."

Name.....

Address.....

City.....State.....

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SIX BIG AUTO BOOKS ALL SHIPPED FREE

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SYNCHRO-MESH
OUTBOARD MOTORS
MOTORCYCLES
TRACTORS
ALL FULLY COVERED

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Can you take out "play" in differential? Can you kill the "shimmy" in steering? Can you reset TIMING? Can you put your finger on engine trouble without guessing or tinkering? Can you pull the starter off and fix it? Can you adjust and repair transmission, engine, rear axle, bearings?

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Nearly 3,000 pages, over 2,000 illustrations, wiring diagrams, equipment charts, etc. De Luxe edition with gold-stamped flexible binding. Sent FREE for 10 days' use. If not wanted return express collect. If kept, send only $2.00 after 10 days, then $3.00 a month until special advertising price, $24.80, is paid.

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I would like to see the brand new 6-volume edition of your automobile books but without any obligation to buy. I will pay the few cents delivery charges only and will examine the books and return them at your expense in 10 days unless I like them, in which case I will send you $2.00 then and only $3.00 per month until the special price of only $24.80 is paid. You are to include free, consulting membership certificate in the American Technical Society. Send brand new 1932 edition.

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The coupon must be filled out in full. If not employed write us a letter explaining your work.

ANDY'S SHOP MAIL BOX

(Continued from page 30)

ish I tried to use parts of cars which I did not have to machine and as I bought all of the parts separately and new and did not keep a list, I don't know just what they cost me.

The parts of other cars are chiefly "T" Ford, and since this depression I don't believe there is anyone who has not means of getting such parts "used" now. Even if you do have to pay "used" parts dealer's prices or purchase some of them new, I estimate the material for entire chassis including airplane rims and enough aluminum for the body to cost from $30 to $60 (without motor and tires). Then there are only six parts which have to be machined and as the work on these is not elaborate, they can be purchased to order from me or elsewhere as the builder wishes.

As my aim was to do away with the machining, etc., and to make it appear to be all special parts—take for example the front spindle which has to carry the load, steer and has a brake shoe on it, it has no machine work on it and is made of almost all "T" Ford parts and has only four brazed joints on each and all of the parts are worked down so you can not recognize any of them and appear to be all special parts.

The whole car rolls on "T" Ford Timken bearings, so the front spindle which causes most fellows worry is really quite simple and easy to put together.

The rear end of the chassis is equally as simple, (cut down Ford hubs and spindles assembled onto radius rods and an Oakland running board support as a rear axle).

The body can be made of old car aluminum, using paint and varnish remover to take the paint off and pounding it to shape, then filing it smooth and polish it down. This old body aluminum does not cost many $ and is very easy to pound out to any shape you desire (after a little practice on a small piece you will be surprised with the ease you can work it out).

If there is any one who wishes to use a Henderson motor, the frame will take it with the change of motor supports, so you don't have to have an Indian 4 motor if you can get something else.

Very truly yours,
EDW. A. BORNTRAEGER.

The recent controversy we have run in this bar'l o' pied type concerning what should be run in the book and what should not be run has elicited a lot of letters, many of which are too lengthy to quote or to make the Mail Box. Several of the side skirmishes have penetrated to the inner spindle from whence all letters are quoted, and I'm interjecting a few for those who remember the w.k. stumma kake. Here's interjection 1:

Middleburg, N. Y.

Dear Andy:

I heartily agree with R. D. McGilvera, Louis J. Pytel, also there are many others. What do mechanics have to do with card tricks and puzzles, also Hindu magic? I say, ole Bean, why not give the public a magazine

(Continued on page 36)

"What a surprise I gave the crowd the first time I played for them."

Choose Your Course

Piano	Violin
Organ	Clarinet
Ukulele	Flute
Cornet	Saxophone
Trombone	Harp
Piccolo	Mandolin
Guitar	'Cello

Voice and Speech Culture
Piano Accordion
Hawaiian Steel Guitar
Harmony and Composition
Sight Singing
Drums and Traps
Automatic Finger Control
Italian and German Accordion
Banjo (Plectrum, 5-String or Tenor)
Juniors' Piano Course

I haven't known a lonesome evening

. . . . since I discovered this easy way of *teaching myself* how to play in my spare time!

IT'S all very well to read or even listen to the radio—*for a while*. But a fellow wants to be doing something—wants to meet people—have a good time. And why not? You're only young once.

Yet somehow I couldn't make friends. I'd be invited out occasionally but these occasions were few and far between. I must have been considerable of a wet blanket at parties. You see, all the other guests were able to do their share toward making things lively by entertaining in one way or another. But I was able to contribute nothing. . . . No wonder they didn't invite me often!

But that was before Bob took me in hand. Bob played the piano marvelously well—and I loved to listen to him.

One evening I commented on his ability to play. He turned to me and said:

"Why don't you learn to play? In your spare time, I mean."

Bob's Method

I must have looked my astonishment, for he continued:

"I know lots of fellows who have learned to play the piano, saxophone, even violin, after work. Just a few minutes a day are all that are necessary."

"What!" I exclaimed. "Why, I thought it took *forever* to learn to play. All those scales and exercises . . . Besides, it's too expensive."

"Nonsense!" Bob laughed. "I'll tell you how *I* learned. You think I play pretty well, don't you?" I nodded. "Well, I *taught myself* to play. Right in this room. Without a teacher. And say, it didn't cost a fraction of what those old-fashioned, slow methods do!"

Then he told me all about the U. S. School of Music method. How the lessons come by mail. How there is no expensive private teacher to pay. How easy the lessons are. How you learn to play *by note* right from the start.

"Listen!" he continued. "I'll prove it to you. Send for one of their free demonstration lessons."

Fun—Popularity

I was amazed when the demonstration lesson came. Why, it was as easy as A-B-C! I sent for the piano course. Almost before I knew it, I was able to play real tunes and melodies. And the lessons were such fun!

But the best part came later. I was invited to fill in at a party. This time I didn't sit in a corner all evening. Instead, I took my place with the best of them—actually played two pieces, "Old Black Joe," and the ever popular "Hallelujah!"—that seemed to make an instant hit with the crowd. At any rate, I received an invitation for the very next week. . . .

From then on my playing has steadily improved, until now I can play anything my friends ask me to. Yes—I have plenty of friends now—thanks to my new found ability to entertain at the piano! Every minute of my spare time is now in demand—parties, entertainments, friends and fun. That's living!

* * * * *

This story is typical. The sooner you get started musically, the sooner you'll be popular. Decide now to learn to play your favorite instrument the U. S. School way. Previous musical talent or knowledge is never required. We've proved that to over 600,000 people.

Whether you take up piano, violin, 'cello, or *any other instrument*, you'll find that every single thing you need to know is explained in detail. And the explanation is always *practical*. That's why students of this famous course get ahead *twice as fast* as those who study old-time, plodding methods.

Free Book and Demonstration Lesson

To *prove* how practical our course is we will be glad to send you a typical demonstration lesson and explanatory booklet—*without charge*. The booklet will also tell you all about the amazing new *Automatic Finger Control*. Clip and mail the coupon NOW, before it's too late. No obligation. Instruments supplied when needed, cash or credit. U. S. SCHOOL OF MUSIC, 2626 Brunswick Bldg., New York City.

U. S. School of Music,
2626 Brunswick Bldg., New York City.

Please send me your free book, "How You Can Master Music in Your Own Home," with inspiring message by Dr. Frank Crane, Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

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Name .....

Address .....

City .....State.....

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for the HOME WORKSHOP FAN

Every plan advertised on this page is a GENUINE blueprint. Do not confuse them with cheap substitutes printed on a printing press. These prints are faithful, actual-size reproductions of the draftsmen's original drawings. They'll survive rough usage in the workshop. Prints are large size, easy to scale off dimensions. Shipped postpaid at quoted prices.

BOATS

GANNET—Ford-Powered

A deservedly popular boat plan. A 24-foot cruiser, powered with Model T Ford motor, driving her at around 15 m.p.h. Uses V-bottom hull, easy for amateur builder. Straight sides easy to plank. Bunks for two; plenty of room for provisions and duffle.
Price of prints **$2.00**

DOROTHY—A Cruiser

Primarily a power boat, designed for cruising economy, not speed. Good for 9 miles an hour with a 10 h.p. marine motor. Ford can be used if desired. Dorothy has a sail if the motor quits. She's 24-foot, plenty of cabin room for two or more; a real deep-water performer. Prints **$2.50**

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A small outboard racer, extremely simple to build. Cleans up in B, C, and D classes everywhere. Strictly a speedboat—easily portable. Prints **75c**

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An outboard runabout and cabin cruiser in one, light enough to move on a trailer. Good for 32-35 m.p.h. with a large outboard motor. Canvas covering which can be put in place in a jiffy gives you a weather-tight cabin for overnight stops. Prints **$2.00**

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A speedboat driven by an air propeller and a converted motorcycle engine of one or two lungs. Lots of fun and plenty of speed. Prints **50c**

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Here's a big little 19-foot cruiser with a big double bunk and stern cabin. You can build her for about $100. Ultra modern, with stern drive engine. About the right size to tow on a big trailer for parts unknown and real adventure **$2.00**

WINK—A Race Boat

Here's a 125 cu. in. race job, over a dozen of which have been built. It is really an inboard motored hydroplane in the outboard size class. Plenty of speed; 40 miles an hour, and not hard to build. Very pretty **$2.00**

TUBBY—A Sailing Scow

A 12-foot sailing scow, just the thing for boating fans looking for something simple to construct. Flat-bottomed, with leeboards—the acme of simplicity to build. Your choice of two sail plans—you can use her as a rowboat, too. Price of prints **$1.25**

SCISSORBILL ICEBOAT

Sailing iceboat, large enough for 6 passengers. Can be built for from $5 to $20, depending on available scrap materials. Prints **50c**

WATER WITCH

This is a Billy Atkin design. Nineteen feet long, with a sail, and an engine. Long legged and big, she'll sail in deep water to your heart's content.... **$2.00**

ALLEGRA

Designed by Farmer and Rhodes. This is an easy to build outboard cruiser for Quad motors and 25 m.p.h. speeds. 17 ft. x 5 ft. 6 in. Light, fairly portable, and very fast and level riding **$2.00**

FORD SPEEDSTER BODY

Racing body for a Model T Ford or similar chassis. Wooden frame covered with chicken wire, then a layer of cotton batting held down by Fabrikoid (imitation leather) covering, makes this a ritzy-looking streamlined job. Costs but a few dollars to build.
Price of blueprints **$1.00**

CAMPING HOUSE-TRAILER

Just the thing for vacation-time—a trailer with beds and household equipment, with a collapsible canvas roof and sides which fold up when not in use. Four or more can sleep in her. Prints **$1.00**

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A sturdy auto trailer which can also be used to transmit power from the car to run machinery, simply by turning trailer upside down and backing it up to rear wheels of car. Blueprints **50c**

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An ideal form of exercising machine that has won wide favor with readers; easily constructed from odds and ends. Price of blueprints **25c**

LIGHT AIRPLANES

PIETENPOL AIR CAMPER

The country's most popular home-built plane. Carries two passengers, powered with Model A Ford motor. High wing monoplane. Cost of construction, including motor, well under $500. Blueprints show both wood and steel tube fuselages, and give motor conversion details. Hundreds of these prints have been sold with complete satisfaction. Price of prints **$7.50**

PIETENPOL SKY SCOUT

A mate to the Air Camper. Single place, powered with Model T Ford motor. Cruising speed, around 75 m.p.h. The most satisfactory light plane with this type of motor. Price of blueprints **$4.00**

RAMSEY SPORTPLANE

A "fool-proof" light plane, carrying two passengers side by side. Powered by Aeronca motor, or one of similar horsepower. Steel tube construction. Low landing speed, extreme ease and safety of handling characterize this ship. Price of prints **$4.00**

We will gladly send further information and description on any of these plans that may interest you.

Modern Mechanics and Inventions Blueprint Department,
529 S. Seventh St., Minneapolis, Minn.

Gentlemen: Enclosed please find $..... in payment for blueprints of..... to be shipped immediately, postpaid, to the address given below:

Name .....

(Please PRINT plainly)

Street .....

City and State .....

(Orders totaling $2.50 or over sent C.O.D. if desired, when one-third payment accompanies order.)

"Gosh! It's Great to Have my Gov't Job -in Times Like These"

No Layoffs..No Worries..Steady Pay Every Week

"LOOK HERE, buddie—what's got *you* so worried? Seems like everybody I meet is afraid of losing his job. Or trying to figure where he can get one, these days. But you don't see *me* looking worried, do you? Let me tell you—my job, my pay, and my future are as sure as sunrise since I got this GOVERNMENT JOB of Railway Postal Clerk! Believe me, I'm sitting pretty. No strikes, no lay-offs, no 'cuts.' Government work goes right on, good times or not. For the first time in my life, *and for the rest of my life,* I can *count* on a steady income!

$1,850 to Start---and Regular Raises

"I got $1,850 a year at first. Now I'm earning $2,700. That's what Uncle Sam's system of regular increases and steady advancement does for you! And listen: Every year I get 15 days' vacation and 10 days' sick leave *with pay.* See a lot of the country at Uncle Sam's expense, too—traveling with the Railway Mail.

PICK YOUR JOB
I'LL HELP YOU GET IT!
RAILWAY POSTAL CLERK
$1850 to $2700 a year
POST OFFICE CLERK
$1700 to $2100 a year
Special Clerks at $2200-$2300
CITY MAIL CARRIER
$1700 to $2100 a year
R. F. D. MAIL CARRIER
$1800 to $2300 a year
INTERNAL REVENUE and CUSTOMS HOUSE POSITIONS
$1100, $1680, to $3000 a year and up
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$1200 to $2500 a year
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$1440 to $1620 a year and up to $3000 a year

How Would YOU Like to Make This Kind of Money? I'll Tell You How

"Maybe *you* are passing up the best bet in the whole U.S.A. for a steady job at steady pay. Does $1,850 to $3,300 a year sound good to you? That's what Uncle Sam pays! You can have your pick of good steady jobs, near home, in Washington, or traveling. You'll be treated fair and square in the Government. And you can stop worrying about the future—no fear of 'living on' your relatives later, because your Retirement Pension takes care of you.

"Do what I did. Get in touch with Arthur R. Patterson in Rochester. He was a Secretary Examiner of the Civil Service Commission for 8 years. It was through the help he gave me that I got such a high rating and got my government job so quickly. Ask him to send you his free book. It will open your eyes, buddie!"

You Land Your Gov't Position —or You Don't Pay a Cent!

The book this Railway Mail Clerk refers to is "How to Secure a Government Position." If you are a citizen, 18 to 50, this book will tell you how to get the Government Job you want. Page 4, for example, tells what Uncle Sam pays. Page 10 tells all about vacations. Page 12 explains how I prepare you quickly and how, if you don't get your job within a certain time after passing examinations, my help costs you nothing. Page 18 tells about automatic years raises. And a lot more.

There's no cost, no obligation at all in sending for your copy of this book. Get it NOW and get ready for the NEXT Railway Postal Clerk Examination! Stop worrying about "hard times" and losing your job. Mail this coupon to me TODAY. Address A. R. Patterson, *Civil Service Expert,* PATTERSON SCHOOL, 436 Wisner Bldg., Rochester, N. Y.

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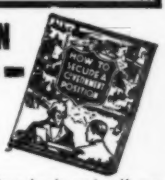

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Please send me your big free book and tell me how I can secure a position with the U. S. Government paying me $1,850 to $3,300 a year, with excellent chance for rapid advancement. This doesn't cost me a penny.

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I train you at home in actual, practical drafting work. Not schoolboy stuff. I put you on the same kind of jobs that are assigned to you when you go to work. It isn't hard to do. You don't need talent. If you are interested and can read and write, I will make you a good draftsman, if you will work. For 30 years Dobe trained men have been employed as draftsmen and chiefs in big concerns all over the world.

YES If you accept me to train, can I succeed in drafting?

YES Is Engineer Dobe's answer to "Do you agree to teach me 'til I'm competent and placed in a permanent position, drawing a good steady salary"?

YES Do I actually get all drafting tools, drafting table and all supplies without any extra cost?

YES Do I get the help as long as I need it about jobs, extra work, fees and how to make extra money?

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Mail the coupon below Now. Don't pass up this opportunity for lack of ready money. Don't keep yourself down by thinking of your finances. It isn't a lot of money I want. It's men. Mail the coupon and see.

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Send me free and postpaid, your book, "My Pay Raising Plan," also Practical Draftsmanship Book and Special Offer on all Drafting Tools and Table furnished to me without extra cost.

Name _____

Address _____

City _____ Age _____

ANDY'S SHOP MAIL BOX

(Continued from page 32)

with these forms of trash left out. I have completed the book ends of the model cannon and grog tub. I finished painting the hull of the hot-air drive boat just now. The only tools I used in making either were a sharp heavy jackknife, bit and stock, saw, sand paper, hammer, and a screwdriver sharpened for a wood chisel, also plenty of muscle and *!****!?!!? Well, you know what that means when you cut your finger deeply. Hi, sye ole toppah, cawn't you give us a few more things to whittle? I am going to make a jig saw and lathe from plans found in your so estimable magazine. Tomorrow I start on the comic sea drama smoker's tray in "How-to-Build-It." After that I am going to make the air-driven boat and the "John Silver Cribbage Board." Well, me wee bonnie Laddie, I think I will close, if you promise to give us more "How-to-Build", and "How-to-Make" articles. I just won a contest in a war magazine by drawn cartoons. I will send pictures of all I make shortly, if you want them. Wait till you see the clipper ship I rigged by looking at the model in the article of submarines sinking a clipper for the movies. I threaten you with a letter once a week if you will be good. Toodle-oo—

Yours truly, (and how)
HAROLD E. RIVENBURGH.

P. S. What is Don Arlen's address? Ha! Ha! Don't throw that brick because I don't mean it.

Which letter being what it is, stands on its own feet without any wisecracks from me. And now along the spindle comes interjection number two. (You'll notice there's nothing standard in my typography. Original, that's me.) Attend ye:

Los Angeles, Calif.

Dear Andy:

I am a new subscriber to Double M but also a very enthusiastic one. I think the Shop Mail Box is good stuff! Leave the magazine the way it is, what the heck, the "Eds" have to please all subscribers, after all they aren't printing this for their health. The guys that don't like to read how movies are made or how the Hindu fakirs fake can skip over those articles very easily.

I am building a 5½ foot biplane as a hobby, and I am also building a 2 cylinder four cycle gasoline motor to power it. I have had some trouble in obtaining rings small enough, and I wondered if you could help me out. I want rings from one to one and a quarter inches in diameter, and valves large enough to close a seat with a minimum diameter of ⅜". Think you know of any company that makes anything like that? If you don't, the rest of the gang might, so pass it along, will you, please?

I built one engine already. The only trouble was it wouldn't run worth a whoop. It was a three cylinder 2 cycle affair, ¾" bore and stroke. It weighed 12 ounces with-

(Continued on page 38)

Workshop FANS

Ahoy!

Have You Your Latest Copy of *the Only Magazine in a Package?*

Issue No. 2 Now Ready.

MECHANICAL PACKAGE MAGAZINE

Contains Complete Kit for Building a

Real Telegraph Outfit

Between the box like covers of this fascinating mechanical magazine you will find a building kit with all necessary materials for building a combination telegraph key and sounder. It has that regulation "tick-clack" telegraph sound you hear in railroad offices. All switches, wire, magnet bars and so on are included. Get a friend to build another Packmag key and set up your own telegraph line! Switch in on some real fun! Don't miss this issue of the Packmag with the key, surprise enclosures.

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Plans for this Airplane Engine in No. 2 Packmag.

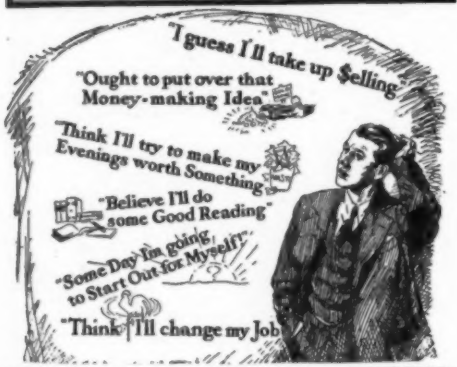
At Last!

A Man's Size Magazine with a Grown-up Slant
The Mechanical Package Magazine is written up for alert minds—not written down for dubs. It is on sale at all newsstands, 25c per copy. If your dealer cannot supply you, send your order direct, enclosing 35c (25c for the magazine—10c for mailing). Address

The Mechanical Package Magazine
529 So. 7th St., Minneapolis, Minn.

On Sale Now 25c

The Man with the "Grasshopper Mind"


"I guess I'll take up Selling"
"Ought to put over that Money-making Idea"
"Think I'll try to make my Evenings worth Something"
"Believe I'll do some Good Reading"
"Some Day I'm going to Start Out for Myself"
"Think I'll change my Job"

YOU know this man as well as you know YOURSELF! His mind nibbles at EVERYTHING and masters NOTHING. He always takes up the EASIEST thing first, puts it down when it gets HARD, and starts something else. JUMPS from ONE THING TO ANOTHER all the time! There are thousands of these PEOPLE WITH GRASSHOPPER MINDS in the world and they do the world's MOST TIRESOME TASKS—get but a PITTANCE for their work.

If YOU have a "Grasshopper mind" you know that this is TRUE—and WHY. Even the BLAZING SUN can't burn a hole in a little piece of TISSUE PAPER unless its rays are concentrated ON ONE SPOT!

Yet you KNOW you have intelligence and ability. WHAT'S holding you back? Just one fact—one SCIENTIFIC fact—PROVED and stated by the world's foremost scientists and psychologists. You are using only ONE-TENTH of your real BRAIN-POWER! The mind is like a muscle. It grows in power through exercise and use. It weakens and deteriorates with idleness. Increase your BRAIN-POWER and you will increase your EARNING POWER.

But HOW? Spend 2c for a postage stamp. Send the coupon below for a copy of "Scientific Mind Training."

This little book will tell you the secret of self-confidence, of a strong will, of a powerful memory, of unflagging concentration, of keen imagination—showing you how to banish negative qualities like forgetfulness, brain fag, indecision, self-consciousness, lack of ideas, mind wandering, lack of system, procrastination, timidity.

Men like Edgar Wallace, the famous author, Sir Harry Lauder, Prince Charles of Sweden, Frank P. Walsh, chairman of the National War Labor Board, and hundreds of others equally famous, praise the simple method of increasing brain power described in this free book about Pelmanism. Over 750,000 OTHERS, all over the world, of every station in life, have been helped by this revealing book.

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New Rochelle, N. Y.

Please send me without obligation your free booklet, "Scientific Mind Training." This does not place me under any obligation and no salesman is to call on me.

Name .....

Address .....

City ..... *State*.....

ANDY'S SHOP MAIL BOX

(Continued from page 36)

out the coil and battery. I figure on about the same weight for the next one, because I am going to use a lot of aluminum in it. I expect that the ship and motor will come to 2½ or 3 pounds complete.

Also, if you know of anyone in these parts that wants to sell a lathe with a 3 or 4 inch swing, let me know, please.

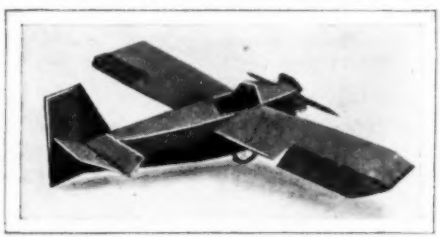
Thanks in advance, Andy.
Happy Landings,
CLAUDE NOLTE.

Rings? Rings, you are asking me about this bright and shining morn of May? I can tell you anything, Claude. Lemme wiggle my toes in my socks. I send out the question. It comes back like a flash. "Go to the ten cent store an' git 'em." Diamonds and everything.

Seriously, I think Elmer Wall of 5900 No. Fairfield Ave. Chi, can give you the rings you want.

* * *

Right back at you with some light plane info:



Penguin Hedge Hopper or training plane built from Flying Manual designs by Robert Hipson of Morristown, New Jersey. Close adherence to plans always insures success.

Morristown, N. J.

Gentlemen:

Enclosed find some pictures of a "Penguin" practise plane which was built by my friend, George Dallenger and myself in 3 weeks of our spare time. The plans and the instructions on how to build this practise plane were secured from your 1932 edition of the Flying and Glider Manual.

1. The fuselage struts are of ¾x½-inch material instead of the ½x½-inch material called for in the plans.

2. The longerons in the fuselage instead of being the specified size called for in the plans, (¾x½) they measure ¾x¾ inches square.

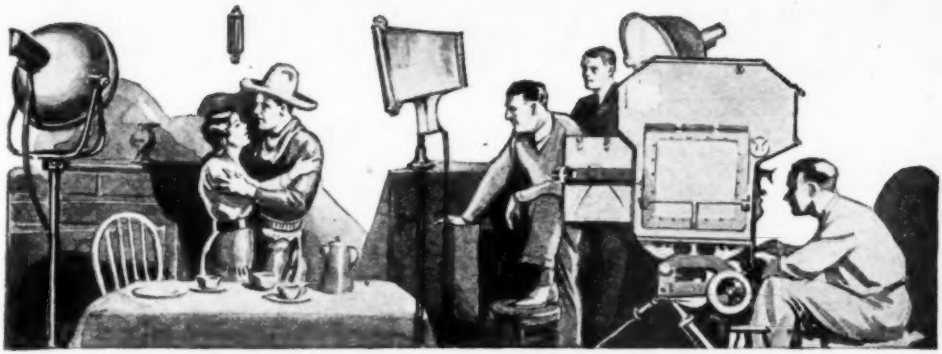
3. The spars in the wing measure as follows: front—¾x2½ and the rear is ¾x2¾ inch, thus making the airfoil section create a higher lift with which we expect to make the ship "hop."

4. Enlarged control surfaces.

Yours sincerely,
ROBERT HIPSON.

* * *

The Vol. 1, No. 2 issue of the Pack Mag is on sale everywhere.



LEARN RADIO-TELEVISION TALKING PICTURES in LOS ANGELES

Get your training in California where many of the famous Radio Stars make their home—where the great American Television Laboratories are located—and hundreds of trained Sound Engineers and Mechanics are employed in the Talking Picture Studios, Broadcasting Stations and Theatres of Hollywood and Los Angeles.

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For a limited time we are allowing coach railroad fare to Los Angeles from any point in the United States. This is included in and deducted from your tuition, so the trip costs you nothing extra. Take advantage of this opportunity to visit Los Angeles and Hollywood, and prepare for a good paying Radio job at the same time. Mail coupon for full details.

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At the Oldest Trade School in the West

For over 25 years National has been training men by the practical shop method. Over 20,000 ambitious men from all over America have come to National for their training. You'll find National graduates working in the famous Studios of Hollywood, in Talking Picture Theatres, great Broadcasting Stations, for Radio Manufacturers and Dealers, while many have gone into the Radio business for themselves and are making big money as their own boss. What they have done, you should be able to do! Mail coupon for proof!

MANY JOBS WILL BE OPEN

10,000,000 Radio sets to be constantly serviced! 600 Broadcasting Stations employing trained Operators and Mechanics! 10,000 Theatres equipped for sound and the job only half done! Eight stations already sending out regular Television programs! New jobs will be opening up every day—hundreds of golden opportunities for the trained man. And you can prepare for them in 4 months at National!

FREE EMPLOYMENT SERVICE
Many Earn While Learning

When you've finished National Training—four months of practical Shop Work in the great National Television, Talking Picture and Radio Shops,—then National's Employment Department will assist you in every possible way to get the job you want. And if you're short of money, after paying your tuition, we will gladly do all we can to help you get part time work to pay your room and board while at school.

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Get all the facts! Mail coupon below for our Big Free Book, telling all about National's famous Shop Training and the many jobs opening up in these fascinating fields. No cost or obligation! Just mail the coupon.

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Los Angeles, California.

Please send me your big new Free Book on Television, Talking Pictures and Radio, and full details of your Railroad Fare offer.

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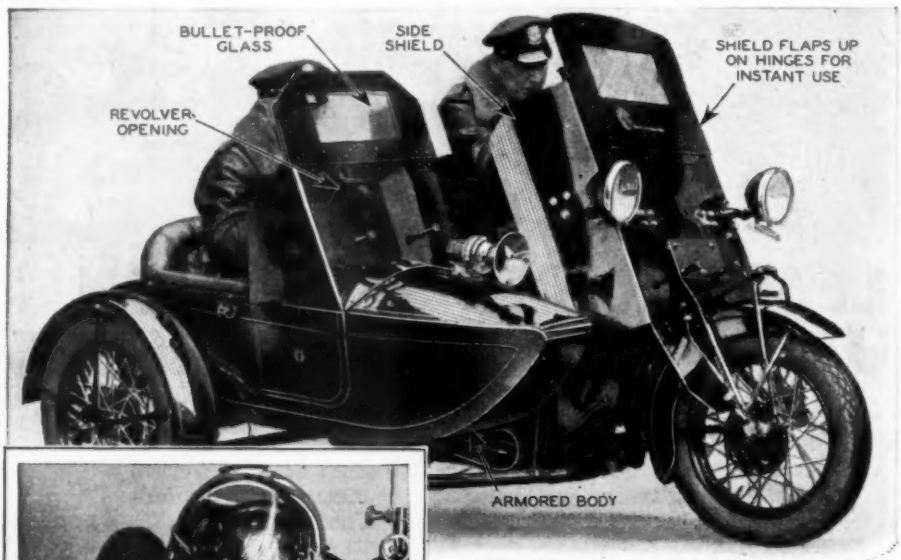
New INVENTIONS that



This latest model armored motorcycle is unique in its provision of hinged shields which the officers can swing up before their faces for protection. Glass is bullet-proof.

Ultra-violet or "black light" rays filtered through this lamp detect forged checks or documents, as shown, and can even detect spurious jewelry or bootleg liquor, as explained here.

Inventors working in the cause of law and order, inspired by a recent outbreak of outrageous kidnapings and other crimes, have perfected numerous devices which give the police a new advantage in the perpetual war on criminals. Crime weapons are fully discussed here.

COULD the immortal shade of Sherlock Holmes return to earth, he would find a new delight in using the latest weapons of science to wage war on criminals—criminals, incidentally, of such perverted genius and "big business" organization as to make the notorious Professor Moriarty of Holmes and Watson fame a decided back number.

Inventors, spurred on to supreme efforts by the kidnaping of the Lindbergh baby and a series of other baffling crimes, have turned their talents to the production of defensive machines which will make it doubly difficult for crooks to commit crimes with any prospect of successfully getting away with them.

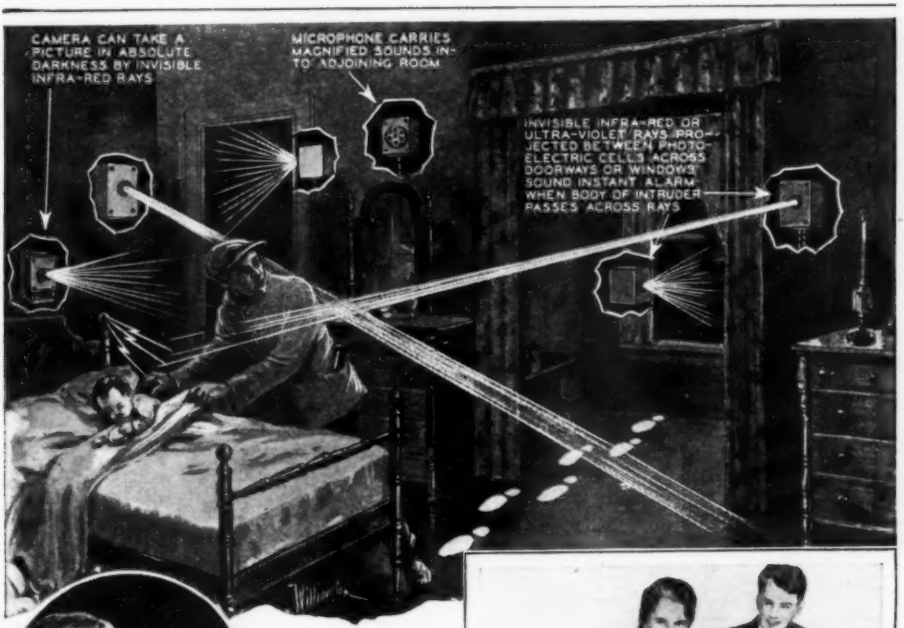
"Black magic" light, by which is meant the infra-red or ultra-violet rays of the spectrum invisible to the human eye; the marvels of the photo-electric cell, which operates burglar alarms, flashlight cameras, and all manner of warning devices; teletypewriter and telephotograph systems which enable police departments of widely separated cities to get in touch with each other instantly, exchanging information and rogue's gallery photos in the twinkling of an eye—these are but a few of the adaptations which are going to complicate the future business of law-breaking.

Photo-Cell Operates Devices

The photo-cell, popularly known as the electric eye, is a super watchman which will give immediate warning of any attempt to enter a building. For such purposes, an infra-red or ultra-violet light projector is used to throw an invisible beam across the windows, doorways or corridors of the building to be watched. This beam is directed on a photo-cell connected to a minia-

Baffle Crooks

by LEW HOLT


CAMERA CAN TAKE A PICTURE IN ABSOLUTE DARKNESS BY INVISIBLE INFRA-RED RAYS
MICROPHONE CARRIES MAGNIFIED SOUNDS INTO ADJOINING ROOM
INVISIBLE INFRA-RED OR ULTRA-VIOLET RAYS PROJECTED BETWEEN PHOTO-ELECTRIC CELLS ACROSS DOORWAYS OR WINDOWS SOUND INSTANT ALARM WHEN BODY OF INTRUDER PASSES ACROSS RAYS
KNOWLES TUBE SET OFF BY ELECTRICAL CAPACITY OF HAND

The recent kidnaping of the Lindbergh baby brought forth a flood of devices for the prevention of such crimes. Invisible light beams which sound an alarm when interrupted by an intruder and which actuate a camera that takes a photo in absolute darkness; microphones which bring to the parent's ear the slightest sounds in the nursery; the Knowles tube, so sensitive that the approach of an intruder's hand sets it off and sounds an alarm—these are a few of the protective measures to protect against this most despicable of modern crimes.

If an individual carrying a concealed revolver passes between the coils of this bandit trap, a burglar alarm is automatically set off and a flashlight photo of the intruder taken.

ture relay, so adjusted that it is held open as long as the beam falls on it.

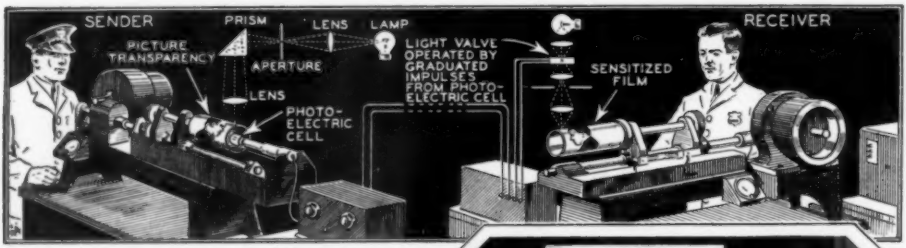
The moment an intruder intercepts the beam, however, the relay trips, closing a secondary power relay which rings alarm bells, turns on lights throughout the building, or does other things according to the way it is hooked up.

To keep watch over some particular object within a building, such as a child's crib, if the frustration of kidnapers is the object, the invisible light projector should be mounted rather high up on the wall, with the photo-cell supported on or near the floor so that the rays travel diagonally downward in front of the object to be protected. This makes it practically impossible for an intruder to avoid disturbing the system at some point.

At the same time an alarm system is thrown into action, a relay can be employed to operate a concealed camera capable of taking a picture of the intruder without his being aware of the fact. Film emulsions sensitive to infra-red rays are already available and are being rapidly developed by the photographic companies.

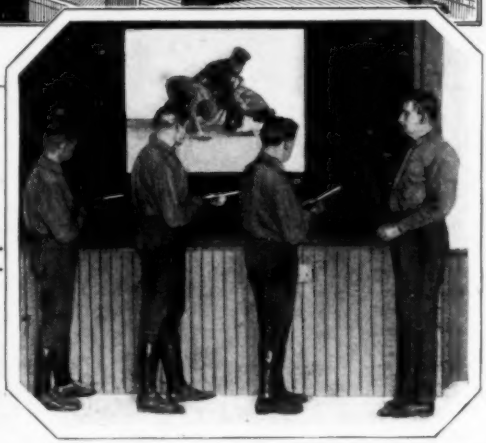
Motion picture cameras operated by photo-cells have been employed to take a single picture of every person passing a certain point. Thus everyone entering a bank vault will intercept a beam of light directed on a photo-cell, and his picture will instantly be

Telephoto Sends Pictures of Criminals Across Continent in 10 Minutes



Principle of the telephotograph machine, which sends a crook's photo across the continent in a few minutes, is shown above, with sender at left, receiver at right.

This is a reproduction of a fingerprint record and rogue's gallery photo received over a telephotograph machine. Transmission time between Boston and San Francisco was only ten minutes. Except for a slight parallel-line effect, the telephoto is an exact duplicate of the original photograph.



Movies showing a policeman wrestling with two crooks are used to train rookie cops how to shoot the criminals without hitting their fellow officer. Photo taken in police shooting gallery, where men are trained for the force.

recorded on a roll of film. In case of a hold-up, the film is developed and the bandit can be identified by comparison with police pictures.

Another interesting application of photo-cells is the system whereby a policeman in making his rounds throws a beam from a pocket flashlight on a photo-cell inside the shop window, thereby turning on the lights in the store. After making his inspection, he extinguishes the flashlight and the lights are turned off.

Bandit Trap Detects Revolvers

A bandit trap which gives warning of a hold-up before it has a chance to occur is the invention of Victor Breitenstein of Chicago. Coils installed on either side of a door or other passageway through which people enter stores, banks, or any building to be protected, sound an alarm and open a camera shutter if the individual passing between them carries a revolver in his pocket. The device is shown in one of the accompanying photos.

In a test, inventor Breitenstein placed a revolver in his hip pocket and passed between the coils. Instantly a buzzer sounded, a red electric light flashed, and a camera took a flashlight photo. Relays could be hooked up to close and lock a bank door automatically. In the case of some person carrying an innocent metal object, such as a hammer, a watchman could stop the suspect, examine him, and permit him to pass if he carried no concealed weapons.

The bandit trap will also be useful in prisons, where persons carrying steel saws in food or other objects can be detected in time to prevent their visiting prisoners. For home protection, the buzzer could warn the housewife if the person ringing the door-bell carried a gun. Dishonest employes carrying metal objects out of a factory or store likewise could be detected by the machine.

Telephoto Picture System

One new method of running down the criminal which has been operated with little publicity because of the inherent necessity for secrecy to checkmate the master crook's cunning, has been the telephoto system.

Telegraph and telephone companies maintain this type of service for police departments in all the big cities of the country. A visit to the telephotograph room of the American Telephone & Telegraph Company at 15 Dey St., New York City, reveals the amazing efficiency of this new scientific

Criminal suspects, lined up before wall scale, are easily checked as to stature by registering eyes of detectives, posed here to demonstrate the system.

Turntables, on which a criminal stands and is revolved before the scrutiny of detectives, enable every angle of his features to be studied. The device is being demonstrated here by Theodore Wood of Philadelphia police.

aid for the police in their war on crime.

Within an hour and a half every police department in the country is enabled to be in possession of the photograph, fingerprints and rogues' gallery record in general of any person sought in connection with a crime. If the person does not happen to have a criminal record, his photograph and other data can be telephotoed instantaneously.

Photos Checked Almost Instantly

This system is able to broadcast the criminal's photo and his Bertillon record before he reaches any destination outside the jurisdiction of the crime, making it easier for police to apprehend him. As shown in an accompanying diagram, a photo-electric cell is the heart of the telephotograph system.

A transparent positive image is wrapped around a cylinder, inside which is the photo-cell. A pin-point of light is focused through the image on the photo-cell, which, as the cylinder revolves, sends varying electric impulses through a wire, proportionate to the black or white sections of the picture. On the receiving end the process is similar, though reversed.

Electric impulses from the photo cell arrive and are admitted through a light valve which plays a spot of light on sensi-

Special training schools for rookie policemen are elaborately equipped to prepare their students for war on criminals. Here a three-story fire-escape section has been built and student cops are being given a demonstration of the proper way to capture a pair of escaping sneak thieves.

Teletypewriter Gives Police in Scattered Cities Instant Communication

tized film mounted on a cylinder the same size as the one on the sending apparatus. When the film is developed and printed in the ordinary way, a duplicate of the photo on the sending machine is produced. The only noticeable difference is a series of fine parallel lines running across the telephoto, which are inevitable because of the fact that it is scanned a line at a time.

One of the most sure-fire weapons which science has given to the police in fighting crime in the big cities is the tear gas bomb.

Deputy Inspector Louis Dittman of New York calls this the "boogy man" of the criminals. The bomb consists of a bright steel cylinder, 4 inches high.

The use of the tear gas bombs is taught to a special squad of policemen in the new Police Academy building opposite the New York police headquarters. In a corrugated chamber on the roof of the Academy they learn to throw them, learn to use a gas mask in the fumes the bombs release and finally —which is the most trying part of this training—the policemen go into the room without their masks to see how the gas affects them.

Gas Bomb Is Potent Weapon

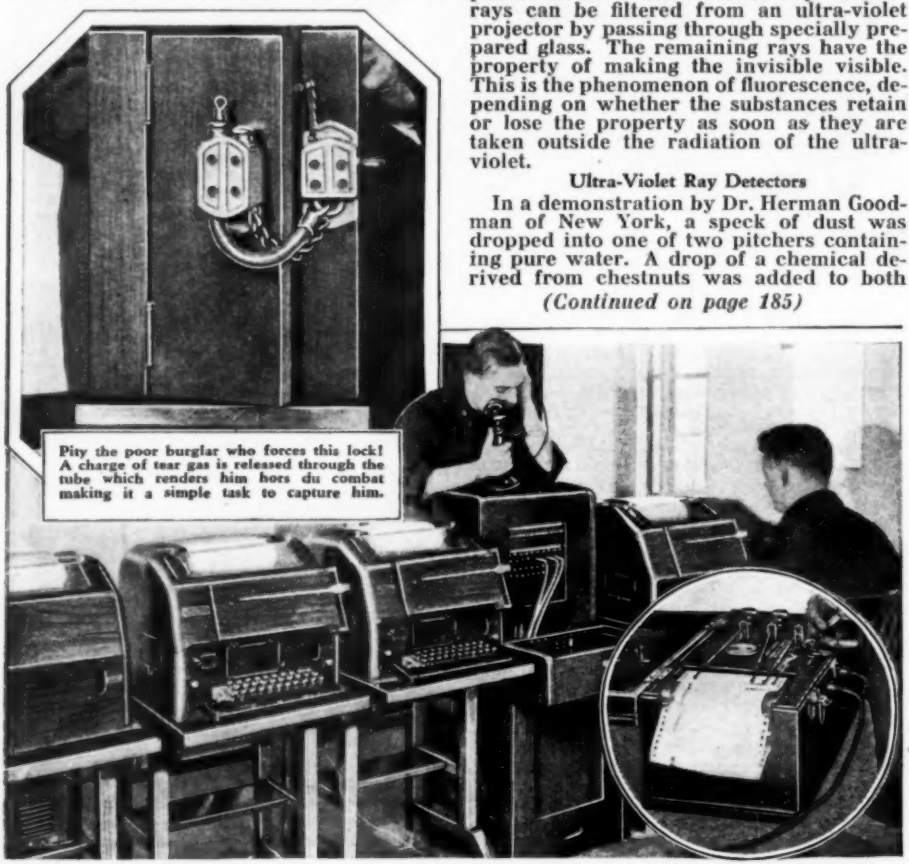
The bomb itself is a small metal barrel with a projecting point that serves as the fuse. A cotter pin is pulled out of the tip, a cap flies back and starts the fuse sizzling. Exactly seven seconds later the gas burns through a wax covering over a set of holes in the barrel and oozes out. Chlorine and picric acid are the bases of this gas.

Forgeries, counterfeits, and similar "intellectual" crimes are likewise being made more difficult for the criminal. The ultra-violet ray crime detector, which is simply a variation of the familiar sun lamp used so widely as a health aid, becomes invaluable in crime detection because every substance placed under it reacts differently. Visible rays can be filtered from an ultra-violet projector by passing through specially prepared glass. The remaining rays have the property of making the invisible visible. This is the phenomenon of fluorescence, depending on whether the substances retain or lose the property as soon as they are taken outside the radiation of the ultra-violet.

Ultra-Violet Ray Detectors

In a demonstration by Dr. Herman Goodman of New York, a speck of dust was dropped into one of two pitchers containing pure water. A drop of a chemical derived from chestnuts was added to both

(Continued on page 185)

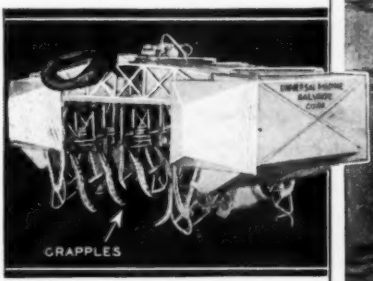


Pity the poor burglar who forces this lock! A charge of tear gas is released through the tube which renders him hors du combat making it a simple task to capture him.

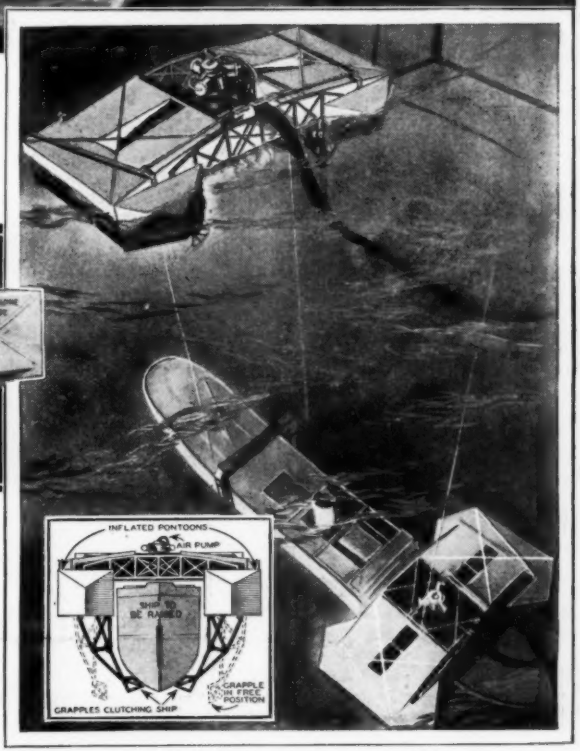
Teletypewriter service, a typical installation being shown above, enables police in widely separated cities to get into instant communication. Insert circle shows lie detector of University of Chicago which registers falsehoods on a graph.

Grappling Pontoons Raise Sunken Ships

Guiseppe Bontempi, inventor, demonstrating model of his grappling pontoons. With water expelled from tanks by compressed air, the pontoons have risen to surface, holding ship firmly in jaws of grappling mechanism. Thus suspended, the ship is towed to drydock for salvage operations. Rigidity of the pontoons permits descent to any depth and in even roughest weather.



Here is a model of the grappling pontoons which Guiseppe Bontempi, inventor and engineer, has perfected for raising ships bodily from the ocean floor. These pontoons consist essentially of a series of tanks built around a framework constructed in form of powerful steel jaws. Locking by the weight of the vessel, the jaws cannot be opened till the weight is released. When the pontoons are emptied of water by compressed air from the pumps aboard the salvage ship, their buoyancy brings the load within the steel jaws to the water's surface. The wreck, being thus suspended and under positive control, can easily be towed to drydock for salvaging operations. Capable of descending to depths too great for ordinary diving, device will permit the raising of all deeply submerged ships.



When grappling pontoons grip ship's hull in powerful jaws, water is expelled from the tanks, raising ship to surface. Insert shows grappling mechanism.

Garden With Artificial Lake Grows in Bottle—But How?

Here is the complete flower garden growing in the thin-necked bottle. Full bloom flowers and plants surround an artificial pond made from half of a hollow rubber ball.

AT a flower show held recently in New York, visitors were startled to see a full-fledged garden growing in a place where no garden has ever been seen before.

That place was the inside of a 5-gallon carboy, as shown in the photo at the left. In this diminutive garden numerous beautiful species of flowers and shrubs were growing as healthily as if they had full benefit of outdoors.

What astonished spectators most, however, was a midget artificial lake set in the midst of the vegetation. It was made from half a rubber ball, and set in place, like the plants and flowers, with extra-long tweezers, the dirt having been poured in first.

New Liner Sports Square Funnels

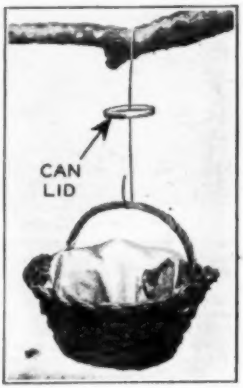
A NEW liner, "The Georges Philappar," recently sailed out from Marseilles on her maiden voyage to the Far East sporting two low, square funnels—the latest fashion for ocean-going liners.

The new funnels give the boat a decidedly rakish and unusual appearance, as the photo below shows. The after funnel is a dummy, but both are finished off the same, with big cornices running around the tops.

Extending but a short distance above the top deck, these funnels offer a striking contrast to the towering stacks with which most of the present-day vessels are equipped.

Camp Food Protected From Insects

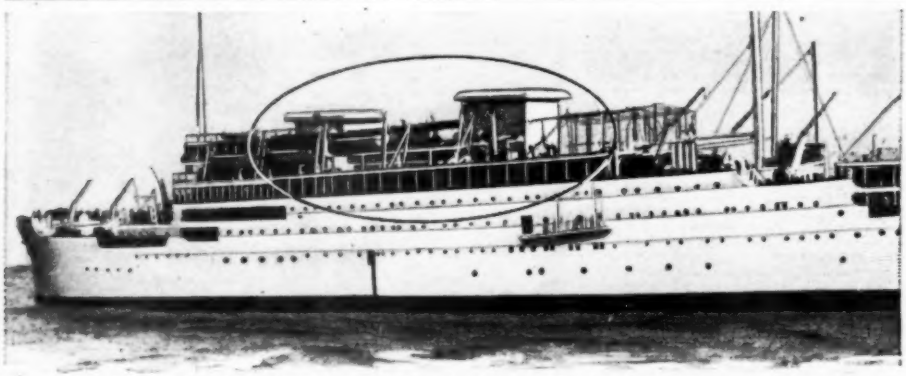
ANTS and other insects have a mania for getting into campers' food supplies, causing them no little discomfort and inconvenience. A simple device, such as shown on the right, will keep the "extra boarders" away from the food.



Water in inverted canister lid keeps insects away from food.

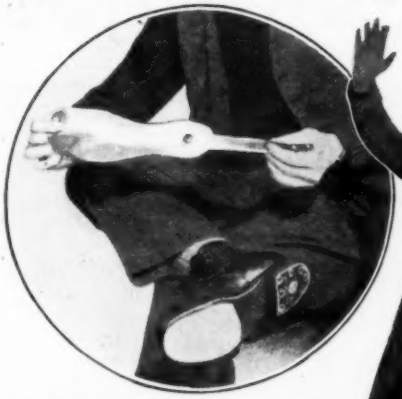
Any piece of strong wire about 18 inches long will do. Bore a hole in a canister lid and slip it on the wire with the concave side facing up. A few drops of solder will hold it in place. Hook the wire to the branch, as shown, fill the lid with water and hook food basket on bottom of wire.

The "creepers'" advance will be stopped by the water barrier.



The new square-shaped funnels for ocean liners are shown in the oval. Note the big cornice running around the tops.

Cops' COLD FEET Heated by Electricity



Insoles with heating elements vulcanized to them are fitted into each shoe and connection is run into the heel, as shown above. Right—Battery terminals are connected to metal plates, contact being made when officer steps on them.

Flexible thin rubber strips with heating elements vulcanized inside are sewed into the uniform, as shown. These are connected to leads in heels by small insulated wires.

CLOTHED in a new electrically heated uniform, recently developed by the General Electric Company, a policeman can stand at street intersections directing traffic all day long in the coldest weather and keep as warm as if he were inside.

Several thin rubber strips about ½ inch wide and very flexible, with a heating element vulcanized inside, are sewed into the uniform, and thin insoles of the same material are fitted in the shoes. These are connected by small insulated wires to metal plates attached to the heels of the shoes, the positive wire leading to one foot and the negative to the other.

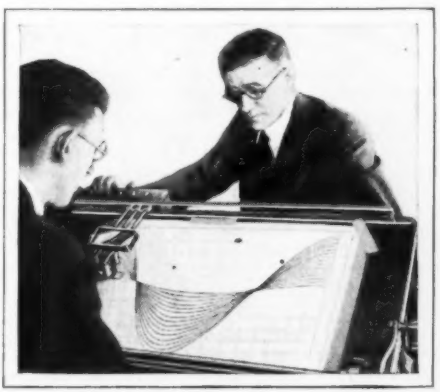
If cold, the officer merely steps on two insulated plates set flush with the pavement. One plate is connected to the positive terminal of a 12-volt storage battery placed in a box below the plates, and the other to the negative terminal. The sole plates form the contacts and within 15 seconds the heating units begin to warm up.

"Mechanical Brain" Works Out Mathematical Engineering Problems

A DIFFERENTIAL analyzer, or "mechanical brain," has been designed by Dr. Vannevar Bush, Dean of the School of Engineering of the Massachusetts School of Technology, which will relieve the engineer and scientist of the burden of making computations which are mechanical and repetitive.

The photo on the right shows the inventor watching his new calculating machine working out a mathematical problem. The charted curves on the input table represent part of the data of the problem in the form in which it is presented to the machine for solution.

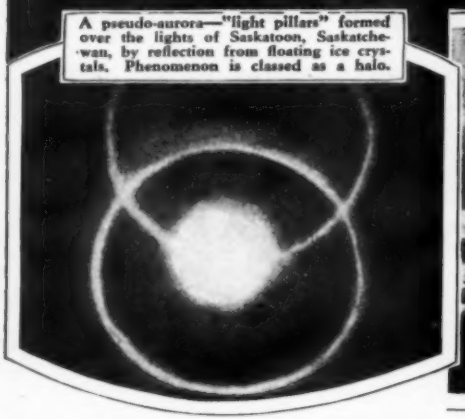
Where a number of computations must be made, this rapid mechanical device will save the user several minutes, and eliminate the many possibilities of errors which creep into lengthy or detailed computations which must be made by hand, with a slide rule, or with the aid of other mechanical machines.



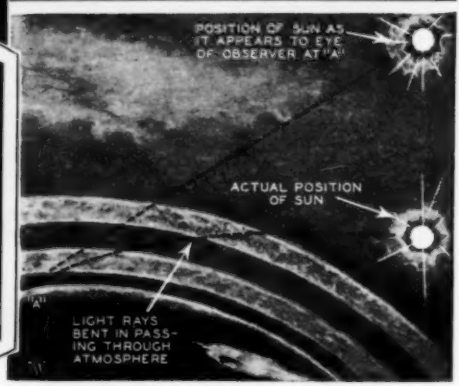
The above photo shows how the mathematical problems are presented to the differential analyzer for correct solution.

Phantoms of the Air, and

A pseudo-aurora—"light pillars" formed over the lights of Saskatoon, Saskatchewan, by reflection from floating ice crystals. Phenomenon is classed as a halo.



A pair of solar halos. The sun is in the center; the halo passing through it is known as the parhelic circle. Halos are usually reflected from floating ice crystals in the air.


POSITION OF SUN AS IT APPEARS TO EYE OF OBSERVER AT "A"
ACTUAL POSITION OF SUN
"A"
LIGHT RAYS BENT IN PASSING THROUGH ATMOSPHERE

Sun rays are refracted or bent in passing through air of increasing density, so its disk is not where it appears to be. Refraction causes objects near horizon to appear elevated.

by **WESLEY FOSTER**

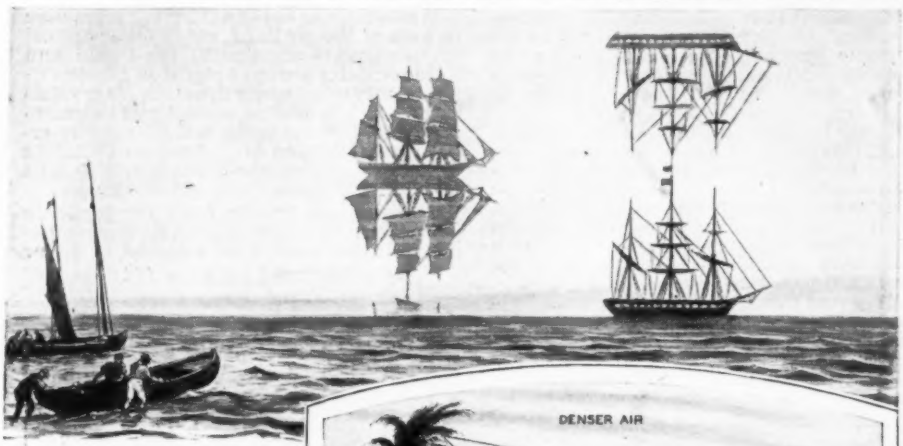
NOT long ago, according to the U. S. Hydrographic Office, a steamer was a few miles off the Carolina coast when the master, scanning the western horizon through his glasses, beheld a curious sight. A vessel, which he recognized as the Diamond Shoals Lightship, was seen suspended in the sky, upside down. This was, of course, a case of mirage, and it was one of the innumerable examples of that strange phenomenon that, in all ages, have aroused the curiosity of mankind.

There are records of many cases much more remarkable than the one just mentioned. A few years ago the inhabitants of two German villages, Doerzbach and Ober-Ginsbach, were startled to observe in the sky, as if on a motion-picture screen, a landscape with fields, streams and woods, among which two bodies of troops in battle formation were advancing toward each other, firing volleys. The puffs of smoke were clearly visible.

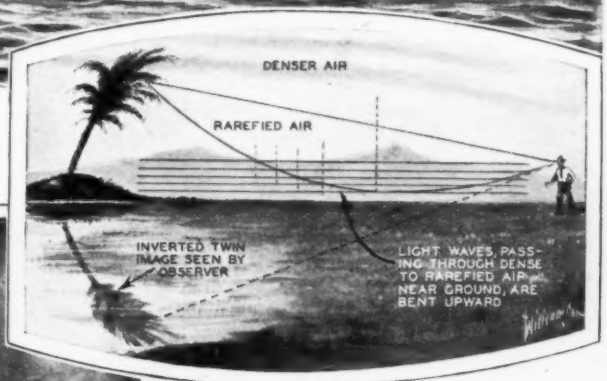
Much alarm prevailed among the superstitious villagers, whose fears were not allayed until the following day, when the local newspaper explained that this weird spectacle did not portend the end of the world, but was just a mirage. Unusual atmospheric conditions had made visible a sham battle held by the garrison at the town of Mergentheim, twenty miles distant.

There are several different kinds of mirage, all of them due to the abnormal refraction or bending of light rays in their passage through layers of air of different densities.

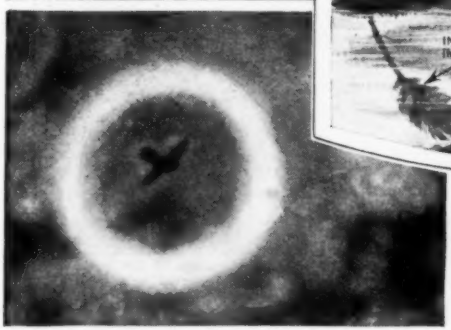
How They Get There



The phenomenon of ships floating in the sky, frequently observed, is scientifically known as a case of "superior mirage." It is caused by abnormal refraction or bending of light rays in passage through air of different densities.


DENSER AIR
RAREFIED AIR
INVERTED TWIN IMAGE SEEN BY OBSERVER
LIGHT WAVES PASSING THROUGH DENSE TO RAREFIED AIR NEAR GROUND, ARE BENT UPWARD

This drawing explains the usual type of desert mirage, where air is less dense near ground than above it. Light rays from objects above rare air level, entering denser air, are bent upward. Thus the observer in this drawing sees the inverted image of the palm as well as the actual tree.



Shadow of an airplane on clouds. The ring of light surrounding it was rainbow-tinted. The phenomenon is identical with the "specter of the Brocken" seen from mountains.

One kind, common over hot plains and deserts in calm weather, presents the illusive appearance of a sheet of water.

It was this type of mirage that astonished the soldiers of Napoleon during their campaign in Egypt and thus first brought the subject of mirage to the attention of the scientific world; and it was the phantom lakes seen over the plains of Kansas that, in pioneer days, gave a certain hack-driver at the town of Ellsworth an excuse for charging travelers an exorbitant price for his services. His racket was to point to the distant sheet of "water," through which, he said, his team must wade, and fix his prices accordingly.

The kind of mirage that suspends one or more images of a distant object above the horizon—sometimes upright and sometimes inverted—doubtless explains the well-known legend of the Flying Dutchman and some of the other superstitious tales of the sea. During the Crimean War the whole British fleet was once seen inverted at a considerable height in the heavens. In 1869 five images of a lighthouse on the French coast were seen, in a vertical line above the horizon, from Folkestone, on the opposite side of the English Channel.

The story is told of a ship that was expected to arrive at New York from England in colonial days. One Sunday afternoon, after a violent storm, she was seen floating in the air, every spar so clearly visible that there was no doubt about the identity of the

image thus depicted in the sky. That was the last ever seen of her. Probably she had sprung a leak in the storm and foundered before she could get to port.

In January, 1913, when the surviving members of Scott's antarctic expedition were anxiously awaiting the return of the ship that was to take them back to civilization, they saw an image of the vessel in the air some time before the ship itself came above the horizon. Considering the circumstances, that was probably the most dramatic mirage on record.

Mirage is responsible for the queer shapes sometimes assumed by the sun when close to the horizon. In some cases the sun has been seen to set, then to rise well above the horizon and set again several minutes later. The variety of mirage called *looming* elevates distant objects above their true positions, thus sometimes bringing above the horizon objects that are normally below it. Thus Mount Canigou, in the Pyrenees, is at times visible from Marseilles, 150 miles distant, though a straight line connecting the peak and the city passes nearly 400 feet below the surface of the Mediterranean.

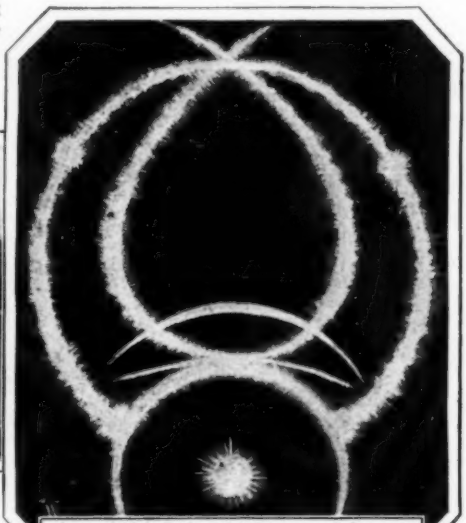
Lastly, when an extensive area of landscape is involved in rapidly changing distortions due to a complex variety of mirage the whole display is called *fata morgana;* a name originally limited to such spectacles seen at the Straits of Messina, though the phenomenon is much commoner in some other parts of the world.

While mirage is caused by the refractive powers of the air itself, many other optical manifestations are due to the liquid and solid particles always present in the atmosphere, including water droplets, ice crystals and dust. These may, according to circumstances, affect the paths of light rays by refraction, reflection or diffraction (bending around small obstacles), and may also split up white light into its component colors.

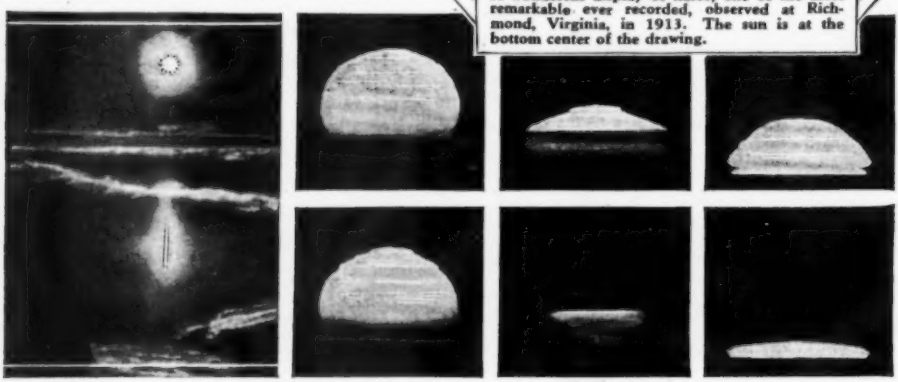
The rainbow results from the presence of water drops in the air, and it takes a number of forms besides the common single or

(Continued on page 172)

A remarkable solar halo, occurring in the Arctic, with a mountain as a background, rather than clouds, as is usual in temperate latitudes. Photo taken in Greenland.

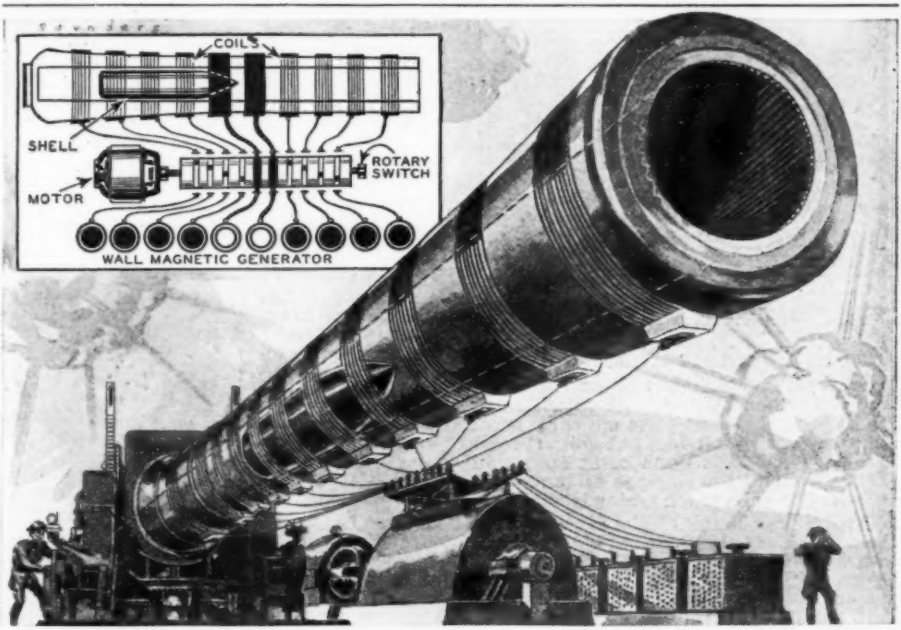


A wonderful display of halos, one of the most remarkable ever recorded, observed at Richmond, Virginia, in 1913. The sun is at the bottom center of the drawing.



At left, above, is the sun and the undersun, the latter being a dazzling image of the real sun formed on the upper surface of a layer of ice clouds. Series of small photos shows queer shapes assumed by setting sun, when near horizon.

ELECTRIC Cannon Uses No Gunpowder



The magnetic gun, pictured on this month's cover, is foreshadowed by achievements of two English experimenters. Powerful currents working through coils around the gun barrel exert a magnetic effect on the steel shell, pulling it through the barrel at tremendous speed. Each coil has its own generator, and the shell advancing through the barrel will automatically energize the coil just ahead of it. A rotary switch could be employed to adapt the idea to machine guns.

SILENT guns sending their whistling messengers of death into the sky at speeds far beyond those now attained by powder-driven shells seem likely for the next war, using for propulsion magnetic fields so powerful that when they are short-circuited they produce miniature earthquakes.

Dr. Kapitza, F. R. S., working at the Cavendish laboratory of Cambridge University, England, in his attempts to disrupt the atom has produced magnetic fields so powerful that they "explode" the coils that produce them. This man has finally revealed the secret of the magnetic gun so long anticipated by ballistic experts. Dr. Kapitza accomplishes the electric firing of a shell by short-circuiting powerful dynamos for periods of one one-hundredth of a second.

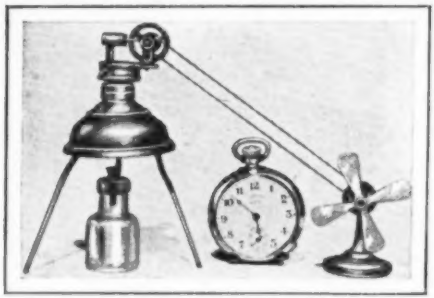
Another English experimenter, Dr. Wall, seeking the same thing, produces ultra-magnetic fields with a more simple apparatus. Dr. Wall simply charges electrostatic condensers and permits them to discharge their powerful currents into specially made coils immersed in oil baths. Here also magnetic fields so powerful that they tear the coils to pieces have been produced. So great are these magnetic fields that they are capable of pulling iron nails out of shoes.

While the magnetic effects produced by both of these experimenters are of very short duration, they could be employed to impart their terrible energy to steel shells. The time limit, which cannot exceed one one-hundredth of a second, is imposed because of the powerful currents used. If these currents were permitted to flow through wire for a greater period of time, the wire would melt and temperatures greater than those existing in some of the hottest stars would be produced.

To produce a magnetic gun—a silent Big-Bertha—it will only be necessary to arrange a series of powerful coils within the gun barrel. Each coil will have its own generator and the shell advancing through the barrel will automatically energize the coil just ahead of it. By the time the shell reaches the end of the barrel it will have attained a speed far in excess of the speeds now attainable with even the highest explosives known.

Owing to the entire absence of internal pressures these guns may be made of ordinary iron or even of purely non-magnetic materials. The "magnetic explosions" will be initiated by the simple closing of a switch which will energize the first coil and snatch the shell from the breech in the first leg of its journey of destruction.

World's Smallest Steam Engine Can Be Placed on a Dime



This tiny fan is run at a high speed by the midget steam engine which gets steam from oil can boiler heated by lamp.

CONSTRUCTION of the smallest steam engine in the world is claimed by W. L. Vaughn, St. Joseph, Mo., watch repairer. His machine, shown on the left, has been made from watch parts.

The engine, so tiny it can be placed on a dime, screws on to a boiler made from a machine oil can, while a small alcohol lamp, about 1½ inches high, furnishes the fire for the boiler. When running, it will drive at a high speed a fan about the size of a silver dollar.

Gas Extinguishes Chimney Fires

A GIANT "match" has been invented which, when lighted, puts out chimney and factory stack fires by emitting great volumes of gas which does not support combustion. The job is done completely and quickly without the damage to the building, which results when water is used.

The extinguisher looks like a heavy paper tube and is lighted by pulling off a piece of cloth tape which has the effect of rubbing the cap of the match against an abrasive surface. Gases are drawn up chimney by draft.

Pipe Filter Removes Impurities

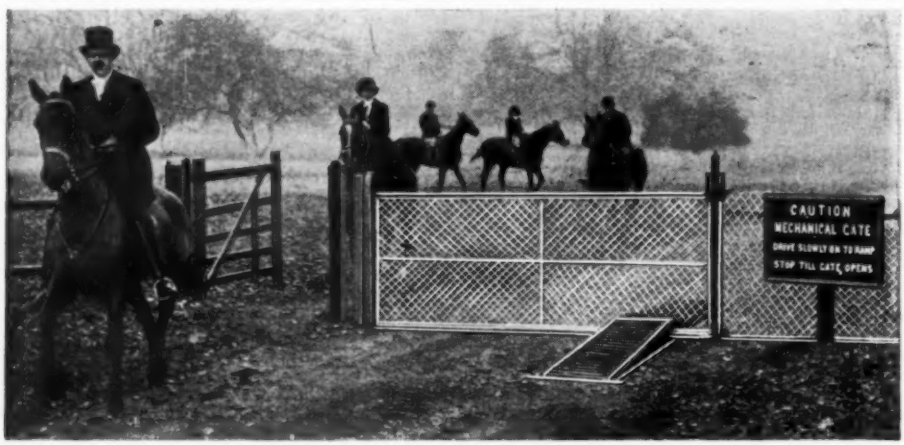
PIPE smokers will appreciate the filter disc, shown on the right, which removes tobacco impurities and takes the "bite" out of a new pipe.

The disc is merely dropped into the bowl as demonstrated; when the smoke passes through its metal flanges it is cooled and the impurities removed before entering the stem.

Smoke is filtered through disc.

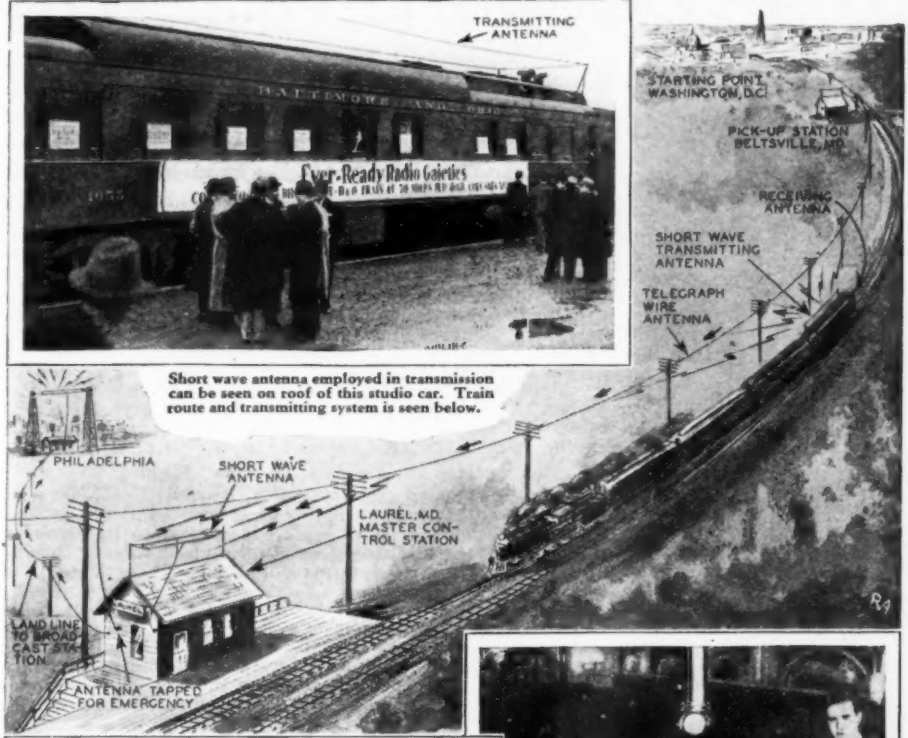
Road Gate Opens Automatically When Automobile Is Driven Onto Ramp

EVERY car driver who has had to get out and open a road gate has hoped for an invention that would do away with that inconvenience. The photo below shows a gate recently installed across a road in England which solves the problem, opening automatically upon the approach of a road vehicle. On each side of the gate is a small ramp. The car driver runs one front wheel up over the ramp and, though he has to come to a dead stop while gate swings open, there is no need of getting out to open and close the gate. Horses are excluded as their weight will not operate the mechanism.

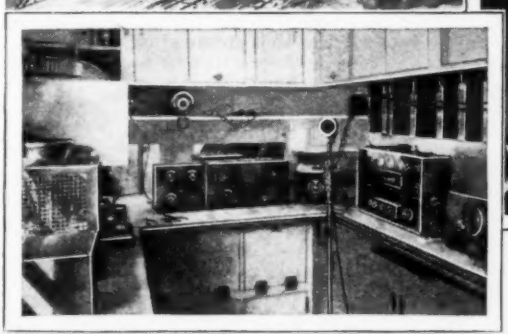


The weight of a car driven onto the ramp starts the mechanism which opens gate automatically. Horses must go around.

Program Broadcast from Speeding Train



Short wave antenna employed in transmission can be seen on roof of this studio car. Train route and transmitting system is seen below.



Short wave signals were put on the air with transmitting equipment shown here, installed in quarters normally occupied by the kitchen. A S.W. receiver permitted preliminary two-way conversation.

Music for the broadcast feat was furnished by this twelve-piece orchestra. Note the mike overhead.

ESTABLISHING a new milestone in the history of radio, a program was recently broadcast to millions of listeners-in from a passenger train speeding between Washington, D. C., and Baltimore, Md., at a clip of 70 miles per hour

In performing this feat of radio transmission, a short wave antenna was rigged up on the roof of the train's dining car, with the sending equipment installed in the kitchen. In the dining room section, the twelve-piece orchestra went through its paces before the mike.

Short wave pick-up stations, employing as aerials the telegraph wire running parallel to the tracks, were established at Beltsville and Laurel, Md. From latter point, at which the master control and monitoring apparatus was installed, a land wire conveyed the program to a powerful broadcast station in Philadelphia. That this pioneer effort was a distinct success was indicated by the fact that radio experts listening in at strategic points picked up the music with amazing clarity and strength. Engineers believe that this feat foreshadows the day of two-way radio communication to and from trains en route.

Toy Balloons Point Way

How a slice happens—the paddle is drawn toward the body when striking balloon, imparting rotation, causing balloon to curve away from driver.

Toy balloons show you how to improve your golf game by pointing out how to avoid dreaded slices and hooks! Study the movie photos accompanying this article, specially taken to demonstrate what happens to a golf ball in flight, and you'll see how the balloons can cut half a dozen or more strokes from your present average score.

EVERY small boy who starts playing baseball in a vacant lot strives to excel in pitching curves, giving the ball a spin to the left or right as it leaves his hand until he is master of incurves and outshoots.

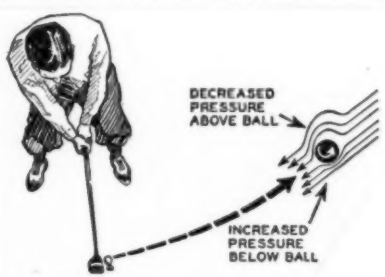
But the object of the beginner in golf is *not* to produce curves to right or left. For him, they are the results of dreaded habits of slicing, pulling, or hooking. His real object, although he may not realize it, is to give the ball a rapid spin from below, upward and forward, with the ball's axis of rotation at right angles to the direction of its flight.

How Air Pressures Affect Ball Flight

When he succeeds in doing this, his drive will have its maximum carry, for the ball will follow (during the first part of its flight) a curve which is convex to the ground, thus gaining the additional height which enables it to take more distance. The reasons for this will be explained later on.

Desiring to give visual proof to himself that ball spins and curves actually occur for the reasons that science has long assumed them to, Gaylord Johnson of Laguna Beach, California, produced the series of slow-motion movies reproduced on these pages.

He secured some toy rubber balloons, inflated them to eight-inch diameter, and cut off the tied stems close to the base.



In above diagram, white arrow inside ball shows direction of rotation when struck squarely below center. Pressure below ball is increased by rotation; pressure above is decreased. The natural effect of this is to cause the ball to rise in an upward curve.

Dotted yellow line shows how golf ball driven as in above diagram rises in an arc convex to the earth before it starts to drop. When the ball is "topped," the spin imparted is forward and downward and the carry of the drive is badly shortened. Approach shots with niblick give forward and up spin to ball which makes it stop dead on the green.

to GOLF PERFECTION

Then, supporting a balloon on a tall cardboard tee, he drove it with a ping-pong paddle. When the stroke was sliced (the ping-pong paddle being drawn across the back of the balloon toward the driver's body) a clockwise spin was imparted to the balloon which caused it to curve its course to the driver's right, producing a "slice."

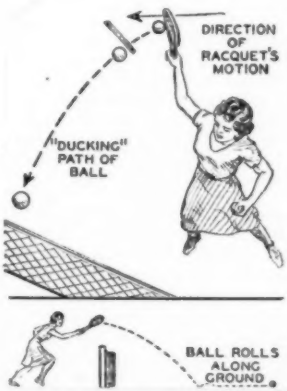
When the paddle was drawn across the rear surface of the balloon, *away* from the driver's body, the flight swerved to the driver's left because of a counter-clockwise spin that produced a hook or pull. In the same way, a stroke straight forward below center sent the balloon curving upward.

Making Bernouilli's Law Work for Golfer

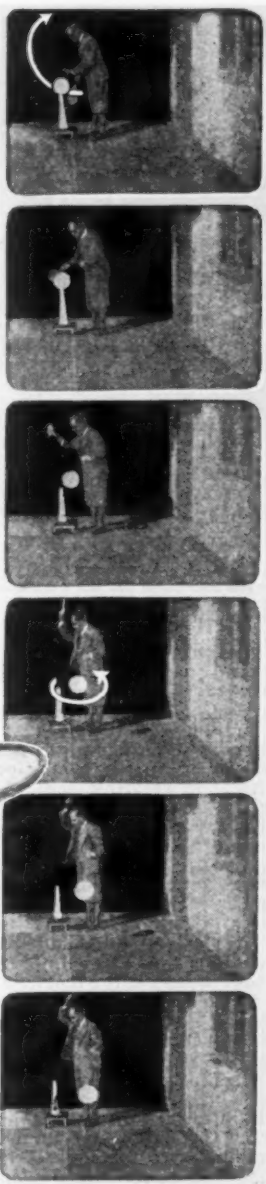
The movies show the flight of the balloon curving much more rapidly than would be possible with a golf or baseball, which is why they were used for demonstration. The balloon cannot be driven with much speed, which gives the difference in pressures set up on its two sides a much greater influence on its flight than would be the case with the heavier sphere used in golf, baseball or tennis.

Why does rotation of a sphere cause it to curve in its flight through the air? An Italian named Bernouilli first formulated the law, which states that when velocity increases, pressure decreases, and vice versa.

Now let us do a little detective work and try to discover Bernouilli's law in the act of producing a "slice" for a golf-player. The golfer has involuntarily drawn in his arms in the middle of his drive, and has not followed through properly. Accordingly, the face of his driver has been drawn toward him, across the ball, thus imparting to it a "clockwise" spin—from the left forward and to the right. There



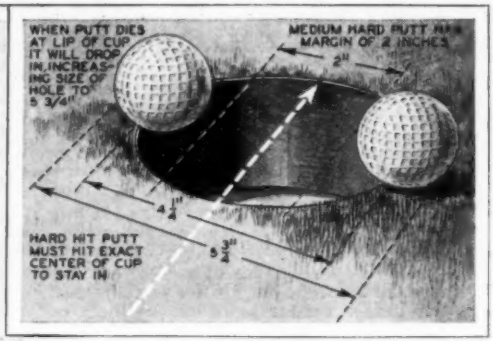
All ball games make use of principles demonstrated by balloon movies. To serve a tennis ball difficult to return, player draws the racquet over the top of the ball as it is driven, imparting a spin which causes ball to strike ground with minimum bounce.



How a hook occurs—Driving paddle away from body imparts spin to balloon, causing it to curve to the left.

Golf Cup Is Inch and One-Half Wider Than the Tape Measure Says It Is

Perfect putts are claimed to be produced by training with this apparatus invented by P. A. Vaile, noted golf authority. The base keeps the feet a uniform distance apart, and the upright keeps the hands properly above the ball to develop the desired wrist motion for best putting form.


WHEN PUTT DIES AT LIP OF CUP IT WILL DROP IN, INCREASING SIZE OF HOLE TO 5 3/4"
MEDIUM HARD PUTT HAS MARGIN OF 2 INCHES
2"
4 1/2"
HARD HIT PUTT MUST HIT EXACT CENTER OF CUP TO STAY IN
5 3/4"

Size of the golf cup depends largely on the speed with which the ball approaches it, as this drawing proves. A lightly driven putt which dies at the lip of the cup will drop in, increasing the effective size of the cup by an inch and a half. But a hard driven putt must strike the exact back of the cup; otherwise it will rim it and keep on its course without dropping. This reduces the size of the cup, for a hard putt, to a two-inch diameter.

it goes, curving off to the right into "the rough"—a perfect slice. Why did it go to the right?

As the golf ball flies, it creates a breeze of its own, which strikes its forward hemisphere, and rushes past on all sides. Since the spin of the sphere is "clockwise," its left surface is rotating *against* the oncoming air, while its right is turning with it. Pressure is reduced on one side (the right) and increased on the other (the left). The difference in these pressures accordingly swerves the flight of the golf ball toward the right.

Works For Tennis Players Too

The same effect is made use of by the tennis player who draws his racquet forward across the top of the ball in serving, in order to impart a spin which will make the ball "duck," run along the ground and be difficult to return. Diagrams explain the principles involved clearly.

A golf "anti-slicer," invented by P. A. Vaile, famous golf authority, is a mechanical aid to players who find it impossible to strike the ball squarely, without drawing the club over the face of the ball in such a manner as to impart a spin resulting in a sliced drive. Mr. Vaile's apparatus consists of leather binding with straps and steel braces, designed to fit over the right knee of the player, holding it practically rigid. Its effect is to make the golfer keep the right knee back until after impact, which is instinctive with all first-class golfers. Leading professionals agree that the device is fundamentally correct and should minimize the risk of slicing.

Another device, also designed by Mr. Vaile, aids the player in learning how to putt. The apparatus, as illustrated by the photo on this page, consists of a piece of steel tubing about two and a half feet in height, mounted vertically in the center of a base a foot in diameter.

Device Perfects Putting Form

The putter swings his club so that his hands are always in line with the top of the tube; this insures the proper wrist motion essential to good putting, since if arm motion interferes and the club is swung out of line, the vertical tube serves as a handy gauge to check the error.

Also the putter learns to stand with his feet a uniform distance apart, separated by the base of the apparatus, so that after a bit of practice it becomes natural for him to assume the same stance, resulting in a uniform game.

One who understands the mechanical principles which govern a rolling sphere can easily cut his score by saving strokes on the putting green.

Putt Into a Bigger Cup!

Any golfer can tell you that the size of the hole is 4¼ inches, but he is only half right. The size will vary from a hair line to as high as 5¾ inches, depending entirely upon the speed of the ball when it reaches the hole.

"Well, I gave that one a chance anyway," a golfer will say when his putt rolls completely past the hole and comes to rest two yards on the other side. Actually he gave his ball the least possible chance to stay

in the hole, for his putt had to follow the exact line to the center of the cup to remain in, and even then, if it was too hard, its momentum would carry it over the hole. For a ball to drop into the cup the pull of gravity must overcome its momentum. It is useless to hit the back of the cup if the ball caroms off to one side.

It is therefore seen that while direction is important in putting, a good touch can overcome a considerable margin of error in direction, since a ball which comes to rest at any part of the cup will drop in.

Golfing Form Becomes Mechanical

Just how important the matter of practice and habit are in one's game is graphically proven by the photograph reproduced with this article, showing Maureen Orcutt, noted woman golfer, playing with her eyes blindfolded. In a series of tests recently she drove as far as she did when not blindfolded, and to within 18 feet of the pin. Mechanical accuracy, a sort of sixth golfer's sense, is developed by constant training.

For a person who has perfected his swing so that it is fairly uniform, a set of well-matched clubs will give definitely determined results.

The manufacturers of clubs have left nothing to chance. Engineers have worked out a definite scale of lofts for each club, and a fine set of clubs can be depended upon to have the exact degree of loft for which it was designed, within one-hundredth of an inch.

How Trajectories Affect Distance

The wood clubs, used for driving off the tee and for long shots from good lies, are heavier than the iron clubs and have a longer shaft; both the weight and the length of shaft contributing to greater distance.

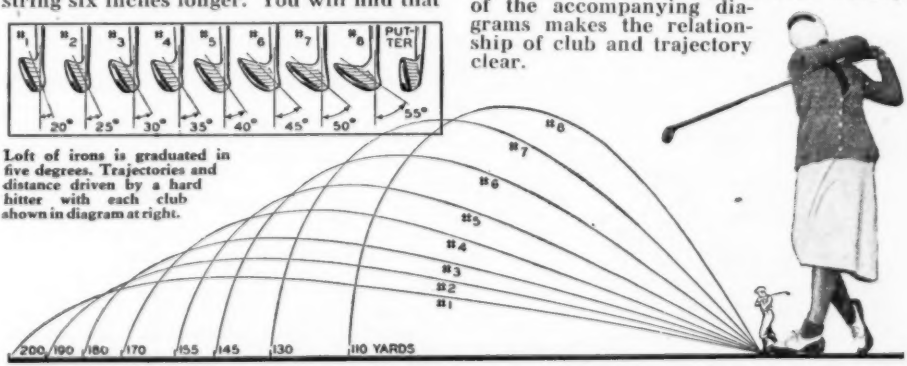
The mechanical theory behind this is simple to test. Take a piece of string about as long as your arm, tie a stone on one end, swing it over your head and see how far you can throw it. Now take a stone weighing a bit more and tie it on the end of a string six inches longer. You will find that you can throw it about ten per cent farther, which is the margin which the woods have over the irons.

The golf anti-slicer, also invented by Mr. Vaile, is a steel and leather brace which fits over the right knee to make the player keep the knee back until after the impact.

Both the wood and iron clubs have been graduated in loft, the irons varying from 20 degrees for the No. 1 or driving iron to 55 degrees for the No. 8 iron or niblick—an increase of five degrees for each of the eight iron clubs. The wood clubs correspond in loft to the first three irons. The accompanying drawings show the trajectories and distances to be obtained from each club.

Note how the trajectories affect the distance traveled by the ball. The No. 8 club, with its 55 degree loft, lifts the ball in a very high trajectory and carries it but a short distance. When the ball strikes the ground it travels with a minimum of roll. A study of the accompanying diagrams makes the relationship of club and trajectory clear.

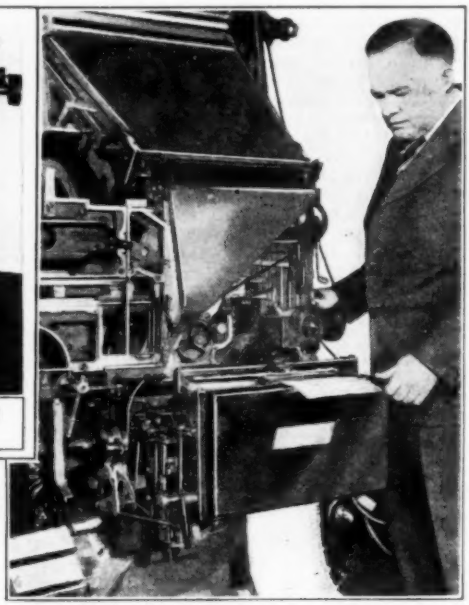
Loft of irons is graduated in five degrees. Trajectories and distance driven by a hard hitter with each club shown in diagram at right.



The fact that perfect golfing form is almost a mechanical "sixth sense" is strikingly demonstrated in the photo at right above, showing Maureen Orcutt, famous woman golfer, driving while blindfolded on the Forest Hills course at Augusta, Georgia. She drove just as far while blindfolded as when able to see the ball, and to within eighteen feet of the pin.

Electric Eye "Reads" Copy, Operates Automatic Linotype

The copy for the automatic linotype is written out in code on this specially constructed typewriter shown above.



Electric eye reads the code dots as the copy runs under tiny beam of light and actuates the typesetting mechanism.

MR. Buford L. Green, of Charlotte, N. C., has perfected an automatic linotype which reads copy direct from the paper and casts the type slugs without any human assistance.

The copy is written in code on the special typewriter, shown at left above. The paper is then placed in the carriage of the mechanism, called a "sesmagraph," which replaces the standard key board.

A tiny beam of light is focused on the copy at the left end of the first line, a switch thrown on, and the carriage shifts the copy to the left until the light has covered the entire line. Simultaneously, the matrices drop into the chamber. When the line is full the slug is cast in the conventional manner.

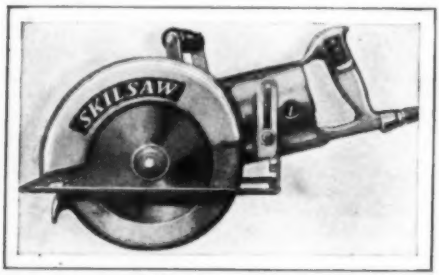
Mr. Green, in explaining the mechanism, states that the beam of light projected through the code dots falls upon a photo-electric cell, or electric eye beneath, which converts the light impulses into electric impulses. These, in turn, operate the selector mechanism to release the proper matrices from the magazine.

Bacteria Manufacture Wood Fiber

IN THE future, a large part of our crop of wood fiber may be supplied by "trained" bacteria. French bacteriologists have analyzed the tough, leathery films built out of sheaths constructed around the bodies of a certain type of bacteria and found it to be made up almost entirely of cellulose.

This is the same material manufactured by most woody plants to make up the fiber of wood, the cotton threads in the cotton plant, and the matted material of paper.

Light Weight Hand-saw Driven by $\frac{7}{8}$ h.p. Motor Cuts at High Speed



The compact design of electric hand-saw shown in the photo above makes it very handy for numerous small jobs.

A 24-POUND electric hand-saw powered by a ⅞ h.p. Universal motor has recently been put on the market. It has a 9″ saw blade which will rip 12 feet of 12″ lumber in 20 seconds or cross-cut 2 feet of 2″ lumber in 5 seconds.

The new saw has a cutting capacity 3 inches deep and is equipped with a tilting base that permits bevelling full 2″ lumber at 45 degrees. The blade has a free speed of 3600 r.p.m. and is protected by a positive automatic spring-operated telescopic guard rotating roller bearings.

The frame is constructed of die-cast aluminum and has an overall length of only 20 inches.

Oddities of SCIENCE

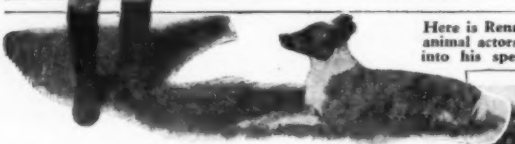
by NIC SPRANK

IF YOU WALK TOWARD A BENCH 10 FEET AWAY, COVERING HALF THE DISTANCE THE FIRST SECOND, HALF THE REMAINING DISTANCE THE NEXT SECOND AND SO ON, YOU WILL NEVER REACH THE BENCH. — C.W. McGUIRE, MONTREAL, CANADA.
A MOSQUITO HAS 22 TEETH, PLAINLY VISIBLE THROUGH A MICROSCOPE. —EDGAR A. POULTON, RINARD MILLS, OHIO.
Nic Sprank
A MASS OF PROTONS (THE NUCLEI OF ATOMS) THE SIZE OF A BASEBALL WOULD BE HEAVY ENOUGH TO FALL THROUGH THE EARTH TO ITS CENTER. Edward Walsh.
A REVOLVING GRINDER THAT CUTS STEEL LIKE CHEESE FEELS LIKE VELVET TO THE HAND. — SAMUEL WING, Alexandria, Minn.
OXY-ACETYLENE TORCH FLAME, HOTTEST KNOWN TO MAN, EMERGES FROM A COPPER TIP WHICH DOES NOT MELT DESPITE THE FACT THAT FLAME TEMPERATURE IS 4000° HIGHER THAN MELTING POINT OF COPPER. — (possible because copper is excellent conductor, dissipating heat to other parts of torch head.) WILLIAM CITAVICZ., Cleveland, Ohio.
A MOUSE'S BRAIN IS BIGGER THAN A MAN'S — (MOUSE BRAIN IS 5% OF ITS BODY WEIGHT, MAN'S BUT 2%) — J.R. RAY. PORT HOPE, ONTARIO.

If you're skeptical about the park bench idea presented above, try to get some mathematician to admit that the half equals the whole! All ideas on this page this month were contributed by readers. Nic Sprank wants more scientific oddities from you, and will pay a dollar for each one used. Address Nic Sprank, Modern Mechanics and Inventions, Minneapolis, Minn.

Mechanical Cues DIRECT

Here is Rennie Renfro, Hollywood's most outstanding trainer of animal actors, with a number of his charges which he is loading into his specially constructed automobile to take to the set.



With the talkie "mike" registering even the faintest sounds, directors of animal pictures are compelled to give directions to canine actors with off-scene signs, as illustrated above.

Animals trained with signs come to respond as readily to written as to spoken commands when performing before the camera. Most intensive training is required, however.

by WALTER A. RASCHICK

When the talkies came in, directors of animal pictures faced a new problem. Before the super-sensitive mike, vocal commands were impossible, so other means of giving "stars" their cues had to be devised. In this unusual article you are taken behind the scenes and shown how directors utilize ingenious mechanical gadgets to make animals perform with keen intelligence before the camera.

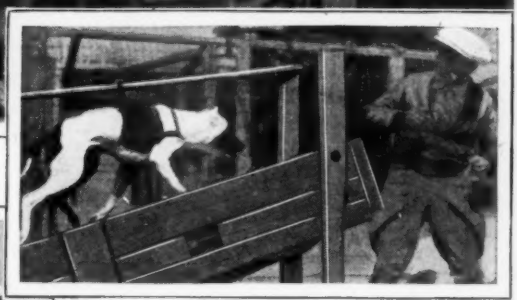
"HOW easy it looks to the spectators, to see animals performing in motion pictures. How blissfully unaware are the majority of picture fans of the patience and courage necessary in training animals to face the cameras. What risks are involved, what matching of intelligence with brute cunning is necessary to trick a beast's subtle brain into passively accepting dull, monotonous routine—these behind-the-scene factors are little known to movie goers."

Al W. Copeland, Hollywood's P. T. Barnum, was talking.

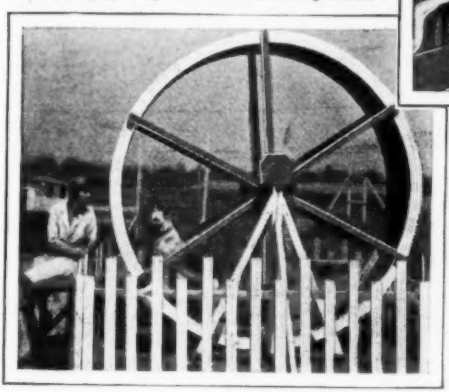
He it is who furnishes circuses for pictures. Twelve years ago, Al trouped to Los Angeles from Massachusetts, with a one-ring country circus—seating capacity, 2,200—in auto trucks. At first intending only to make California his winter circus quarters, Al later saw the possibilities in supplying

Animals in the "BARKIES"

On the set in the "barkie" studio. This unusual photo gives an idea of the unique mechanical gadgets employed by directors of animal pictures.



In teaching dogs to run swiftly to desired point and then put on the brakes, trainers devised this special runway. Canine, harnessed to trolley, falls off and dangles in space unless he stops at proper moment, when signalled to. After few painful trials, the dog learns to halt on sign of command.



Animal actors, confined much of the time to cages, tend to get fat and lazy so trainers have devised this squirrel cage to keep their charges' muscles strong and supple.

equipment—"from an ant to an elephant" (his slogan)—for pictures.

So he remained in Hollywood. Today he has five fully-equipped circuses, with a seating capacity of 12,000 for one of them alone!

"Since talkies came in," Mr. Copeland explained, "training animals for picture work has been doubly hard. In the silent days, a trainer had his charges schooled to respond to vocal commands; now, since the microphone picks up all foreign sounds, signs must be used. When this mechanical revolution came, it suddenly became necessary for trainers to drill their skilled animals all over again to new methods."

Painstaking efforts are required on the part of trainers in first breaking and drilling their charges. This alone takes weeks, sometimes months.

Occasionally directors put in last-minute calls for certain animals, stipulating that the beasts must be familiar with certain definite tricks. Such calls often make it obligatory for trainers to work all night putting their animals through a new routine, so that they will respond perfectly to their cues the next day.

Trainers Are Patient But Firm

Such emergency training quite naturally makes an animal irritable, and it is at such moments when trainers must be keenly on "edge." The slightest slip often spells disaster. In handling any type of animal before the camera, the trainer must constantly exercise the most extreme firmness, for the moment he relaxes his vigilance, the animal senses it and there is havoc to pay.

Bright, Alert Gleam in Eyes Shows Pup Will Make Obedient Barkie Star

Almost every trainer in the picture business swears by his own—and different—method of training. All of them aver that kindness and patience win in the long run. Some believe in rewarding their charges with sweetmeats; others declare that "bribery" is never conducive to best results.

Risks are run, however, even when animals are veteran actors. No matter how thoroughly trained, animals are apt to quake and tremble, run amuck at the slightest change in the routine.

During some night filming in *Rain or Shine*, Pansy, a lady elephant who had campaigned before the cameras since the early silent days, was sedately shimmying through her role when a newspaper cameraman trained his lens on her for a flashlight picture. "Boom" went the flash gun, and Pansy, in her flashlight-picture debut, became panic-stricken.

She trumpeted furiously, thundered through the open tent flaps and ran amuck toward Burbank's residential district. Joe Cook, star of the picture, and trained since his boyhood in circus work, leaped upon a horse and galloped in pursuit. When he came abreast of Pansy, she recognized his horse, stopped in her tracks, turned abruptly, and walked meekly back to her tent.

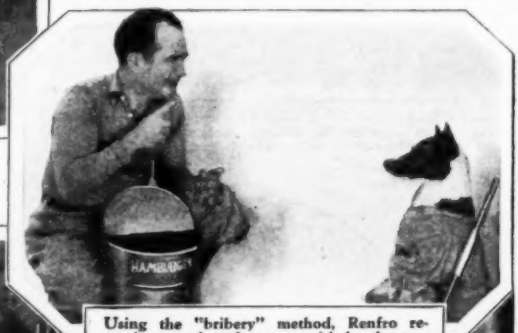
That was a narrow escape—for Pansy as well as for Burbank's citizenry, for circus animals at large usually finish their runaway jaunts at the sorry end of bullets.

Mechanical Devices Make "Stars" Perform

Subterfuge is often necessary to induce an animal, no matter how intelligent or well trained, to do his stuff when something unusual crops up in his routine.

Spots, a pony born and bred in California, worked in Ruth Chatterton's picture, *Once A Lady*. During his part of the action, Spots was supposed to run through a fog.

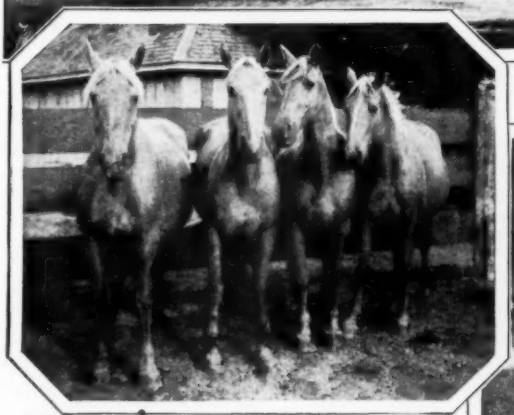
Renfro looks for intelligent, attentive gleam in eyes of applicants when selecting pups for future "Barkie" stardom.



Using the "bribery" method, Renfro rewards a good performance with hamburger.

"Barkies" are usually travesties on hit talkie pictures. Here directors, employing various mechanical tricks, are coaxing the canine star through his performance in "Trader Airedale." With a dog who knows his stuff, the acts progress smoothly.

When Spots in "Once a Lady" balked at running through fog, he was lured through as shown above.



Destined for movie stardom, these four wild Palermo beauties must first have their fiery spirits completely subdued, so that they realize that man is their master. Then they will be taught various tricks required of them before the camera.

Training of elephants begins in infancy. Here is "Snookums," with his trainer, and Dorothy Lee, movie star.

The synthetic fog rolled in as per schedule, but Spots refused to budge.

The pony's owner tried all his tricks, from pleas to threats. But it remained for a prop man to solve the problem by attaching a bunch of alfalfa to an improvised overhead cable carrier out of camera range, and Spots, being allowed one little nibble before the fodder was pulled down the carrier, ran through the fog as nimbly as a coed at a Junior Prom.

In *They Had to See Paris*, Minou, the black cat, was coaxed, to no avail, to walk along the window sill, until everyone on the set was beside himself. Finally, the expedient of daubing the sill with sardine oil was adopted and Minou complacently walked along the route scheduled for the camera.

Animal actors, trainers say, are not adept at concealing their real feelings before the camera. Take, for instance, the case of the St. Bernard dog in John Barrymore's picture *Moby Dick*. The animal was to have appeared in the film, but for some reason known only to himself, he took a dislike to Barrymore.

This was doubly strange in view of the fact that Barrymore's own pets include four dogs and eleven cats, and he prides himself upon being able to win almost any animal's confidence and affection. But the St. Bernard hired to work in *Moby Dick* first balked openly and then went off in a corner and sulked, refusing to move.

John solved the problem by replacing the canine with Peter, his own gigantic St. Bernard. "One of the most intelligent actors in the picture," said John later, in discuss-

ing the incident—and we don't know to this day whether he was referring to the stubborn one or to Peter.

When the mercury rises too high for the animals' comfort, they become drowsy and cannot be persuaded to take any interest in film proceedings; when the temperature cools off too much, they shiver and look for warm shelter.

In a dog act, especially, it is vitally necessary to keep the stage cool, as the minute the canines begin to feel warm they stick their tongues out at the camera and begin to pant, which means that the scene must be stopped until they cool off. Thus the problem of proper heating becomes of vast importance in pictures where animals are used.

Roosters are made to crow by being placed before a mirror. When they see the image of another bird in the glass, they ruffle up their feathers and crow lustily, ready for battle.

Mirror Tricks Rooster Into Acting

When the executives of the old Pathe company (now part of RKO-Pathe) first adopted chanticleer for their organization's trade-mark, trainers had not yet found the mirror system of extracting a tune from a cock's throat. Technicians finally hit upon the expedient of blindfolding the rooster and putting him into a box. Then, suddenly flashing on bright lights, they removed the blind and tossed the bird out of his box and directly toward the lights.

Never once did chanticleer fail to crow with vim and vigor, for he had been artfully deceived into believing that coming blindfolded out of a box into a flood of lights had been a transition from night to day.

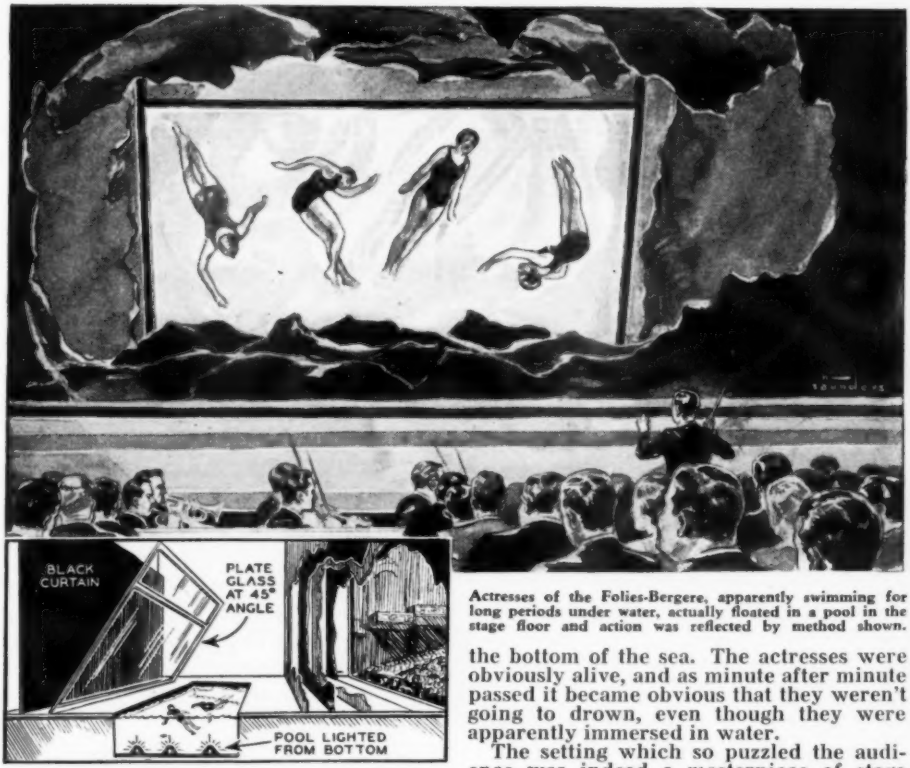
(Continued on page 173)

Here expertly trained "barkie" stars are showing Kay Francis, movie star, that they know correct table manners.

When scene called for cat to walk across window sill, directors smeared sardine oil along path.

"Now sit up gang." Rennie Renfro, trainer of the mutt dogs used in M-G-M "barkies," teaches some of his charges the elemental trick of sitting up at an off-scene signal. Note the finger sign which Renfro is employing for this stunt.

Mermaids Disport on Stage Via Mirror



Actresses of the Folies-Bergere, apparently swimming for long periods under water, actually floated in a pool in the stage floor and action was reflected by method shown.

PATRONS of the Folies-Bergere, famous Paris musical comedy theater, were amazed on the opening night of the current attraction to see half a dozen mermaids apparently swimming about in the depths of the stage in a scene whose setting was the bottom of the sea. The actresses were obviously alive, and as minute after minute passed it became obvious that they weren't going to drown, even though they were apparently immersed in water.

The setting which so puzzled the audience was indeed a masterpiece of stage mechanics. As illustrated in the above drawing, the pool in which the actresses swam was recessed in the stage floor, and above the tank was placed a sheet of plain plate glass at an angle. Behind the glass was draped a black curtain, which gave it the same effect as a mirror.

New Rotary Brush Attached to Faucet Cleans Teeth by Water Power

NOW even the daily task of brushing one's teeth can be done by machine, thanks to the recent introduction of a faucet-power toothbrush.

Bristles of the brush are arranged around a tiny cylinder, which is revolved rapidly when a tube is connected to the faucet and water turned on. A tiny water turbine motor supplies the power. Speed of the brush revolutions can be controlled by regulating the flow of water from the faucet.

Manufacturers of the brush claim that it is much more efficient than the conventional type, and that its operation is so easy as to encourage thorough cleaning of the teeth rather than the hasty brushing which most of us accord our dental equipment. Individual brush attachments for the motor unit are available for family use.

This toothbrush is driven by water power from faucet.

Theremin Cellos Win Music Public in "Electric Concert"

Members of the Theremin Electric Symphony Orchestra making their debut at Carnegie Hall, New York. The electric cellos, seen in the center, reproduce woodwind and brass music, tone and volume being regulated by levers and coils.

THE electric cello, developed recently by Leon Theremin, has now been accepted by the music public as an instrument of high artistic merit.

At a symphony concert of electric music given a short while ago at Carnegie Hall, New York City, the electric cello made a sensational debut in a program consisting of selections from the old music masters—Bach, Haydn, Debussy, and others.

Producing exquisite tones, with both extremes of volume, the electric cellos have as their innards vacuum tubes whose oscillations are controlled by levers and coils on the instrument.

Sanitary Bandage Unrolls in Box

A NEW first aid bandage comes put up on a roller in a box so that there is no inconvenience in handling it during wrapping procedure.

Bandage unrolls in container.

The bandage may be wound on the injured member without the user touching anything but the box. Also, it cannot fall to the floor and become contaminated because the gauze need not be taken from container.

Handy Tool Has 7 Different Uses

PRACTICALLY all the tools you need for a small repair job are incorporated in one handy instrument which is now being marketed. Resembling a pair of pliers in appearance, it includes the features of a screwdriver, tack and nail puller, hammer, small hatchet, pipe wrench, wire cutter and pincers.

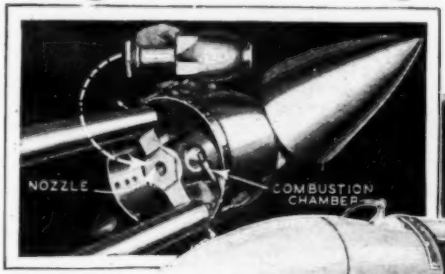
The tool is small enough to fit conveniently into the hand and every tool is ready for immediate use.

This new tool has the combined features of seven instruments.

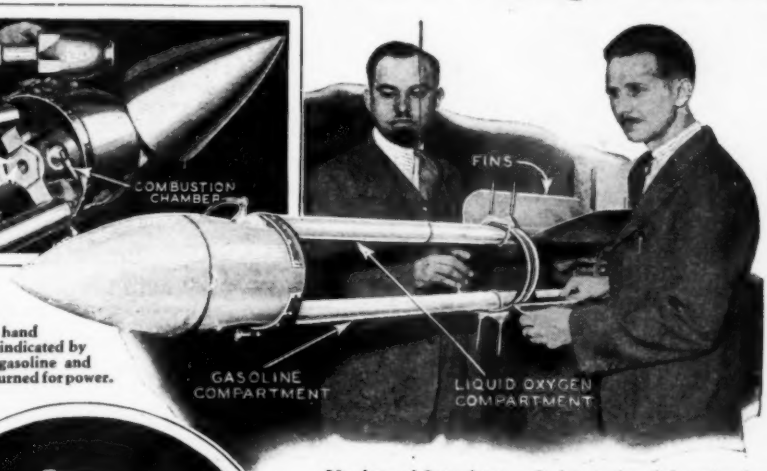
Rules for a Germ-proof Fountain

HERE are a few factors which make for a germ-proof drinking fountain. It should be constructed of a material that does not absorb water, such as china. The water jet should be at an angle and the nozzle placed so that it will not be flooded should drains become clogged. The end of the nozzle should be guarded so lips do not touch it. Finally, the bowl should be easy to clean.

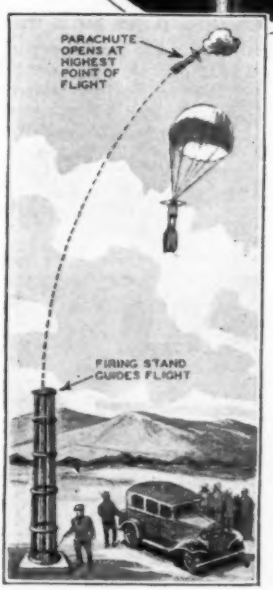
High-Altitude ROCKET Design Tested



Motor parts of the rocket. The combustion chamber held in man's hand fits over nozzle, as indicated by arrow. Here the gasoline and liquid oxygen are burned for power.



Members of Interplanetary Society testing their rocket for balance. The two pipes running back to the fins contain the gasoline and liquid oxygen which is used as fuel. The combustion chamber is encased in a water jacket for cooling.



Above photo shows how halves of the rocket head open up to release parachute at highest point of flight, lowering rocket to earth for further experiments. The rocket will be shot from a 30-foot firing stand, similar to the one shown in drawing.

THE first liquid-fuel rocket of its type ever to be built in this country has just been completed by the American Interplanetary Society, an organization of rocket experimenters.

As shown in the accompanying photographs, the rocket consists of a head containing a parachute and combustion chamber, a body consisting of two hollow tubes, one of which contains liquid oxygen and the other gasoline, and a tail fitted with fins to guide the rocket on a straight course. Aluminum is used throughout.

Intended for testing purposes, the rocket will pave the way toward a larger model if the design proves successful. At its highest point of flight, a parachute in the rocket's nose will be released to lower it safely to the ground.

Larger rockets, to be built this summer, will carry meteorological instruments. A modification of the design should be adaptable to carrying mail at a mile a second clip.

Twelve Tools in One Combined in This Device

A COMBINATION tool which is an adjustable extension rule, compass, inside measure, bevel gauge, marking gauge, 30 degree angle, 45 degree angle miter, diameter and depth gauge, T-square, 60 degree angle, and tri-square is now available to home mechanics. When folded, the Twelve-in-One tool fits easily into the pocket, being only six inches long. A slot in the center which permits adjustment of the two units comprising the tool explains how the single instrument can be adapted to so many purposes. It is finished in brass.

Slots in tool permit it to be adjusted to 12 different purposes.

Electrical Device Tests Nerves to Determine Character

Subject undergoing character test holds one electrode while other is moved about on head. Dial indicates nerve strength.

CRYSTAL gazing and fortune telling are being supplanted as means to determine inclinations and aptitudes of children by an electrical device which examines one's character by testing the relative strength of your nerves.

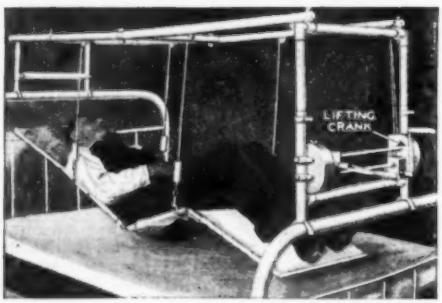
The strange mechanism is an electrical unit operated with two electrodes. One is held in the hand of the subject being tested and the other is moved about on the head. Nerve reactions are tabulated and character determined by comparison to chart.

Platinum Alloy Used by Dentists

THE modern fashion in dentistry is to use more platinum. Platinum dental structures, bridgework and the like, are lighter in color than gold, smaller in size and very strong. What is more, their cost is much less than when only gold is used.

Today, when a modern dentist builds artificial structures he uses alloys of as many as four or five metals, such as platinum, gold, silver and copper. Savings up to 40 per cent can be effected this way.

Machine Lifts Bed-Ridden Patient



The semi-rigid stretcher is in three sections so that patient may be lifted or suspended in comfortable position.

RELIEF for bed-ridden patients from long hours in one position, and from laborious handling by nurses, is promised in a new mechanical invalid lifter.

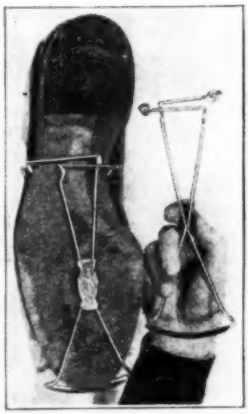
The device, which is adjustable to length and height of any bed, consists of a framework of duralumin tubes attached to the bed, as shown above, and a semi-rigid stretcher which is suspended by four cables running over pulleys from two gear boxes.

The stretcher is constructed with two hinged joints about where the hip and knee joints rest. The patient's body may be raised in one or all of the three planes by winding the cranks.

Metal Shoe Tree Prevents Curling

A NEW shoe saver made like a metal frame fits over the soles, preventing the leather from curling or otherwise losing its shape. It is adjusted to the sole before shoe is removed and serves equally well on either left or right foot.

The new device adds to the life of the shoe by allowing the inside to dry. They can be slipped on soles in a jiffy; clamp will not spring.

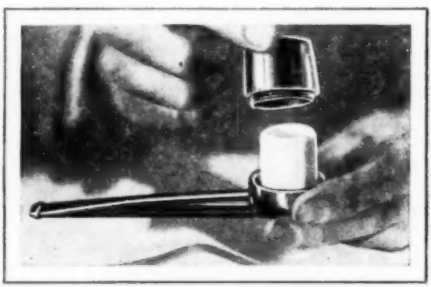


Metal frame fastens on bottom of sole preventing it from curling.

Clay Bowl in Pipe Kills Poisons

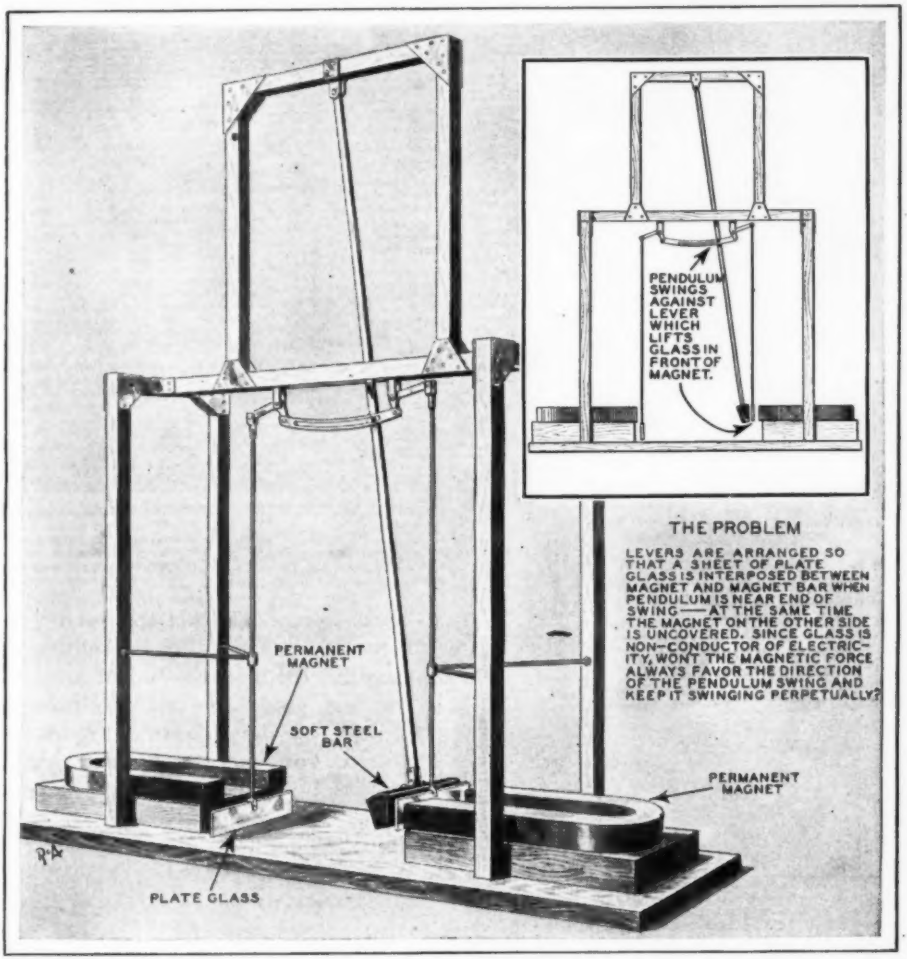
THE special synthetic clay bowl installed in the pipe shown below will remove all the poisons from the tobacco permitting you to enjoy a pure, cool smoke.

The pipe is of bakelite and has two bowls. The inner one is of synthetic clay which will last for over 100 hours; the other fits over it giving the pipe the appearance of an ordinary one. The clay bowl can be replaced at a small cost.



Briar bowl screws into pipe base over clay bowl, which removes tobacco poisons, giving pipe an ordinary appearance.

$10 for the best Letter Answering the Question: *Will This Pendulum Work?*


PENDULUM SWINGS AGAINST LEVER WHICH LIFTS GLASS IN FRONT OF MAGNET.
THE PROBLEM
LEVERS ARE ARRANGED SO THAT A SHEET OF PLATE GLASS IS INTERPOSED BETWEEN MAGNET AND MAGNET BAR WHEN PENDULUM IS NEAR END OF SWING—AT THE SAME TIME THE MAGNET ON THE OTHER SIDE IS UNCOVERED. SINCE GLASS IS NON-CONDUCTOR OF ELECTRICITY, WONT THE MAGNETIC FORCE ALWAYS FAVOR THE DIRECTION OF THE PENDULUM SWING AND KEEP IT SWINGING PERPETUALLY?
PERMANENT MAGNET
SOFT STEEL BAR
PERMANENT MAGNET
PLATE GLASS

HERE'S another in our series of brain ticklers which have had MODERN MECHANICS AND INVENTIONS readers burning the midnight oil to figure them out. Next month we'll print the best letter received in answer to the perpetual motion puzzle in our April issue.

In the meantime, pitch in and try your hand at this magnet problem, which is explained in the drawing above. For the best letter answering the problem as set forth, we'll pay $10—and all other letters printed will be paid for at regular rates.

Here is the problem, stated again so you can't go wrong on it: A pendulum with a soft steel bar at its end swings freely between two horseshoe magnets, which exert an attraction on the steel. But with each swing of the pendulum, a glass plate is swung up in front of the magnet. Glass is a non-conductor of electricity—therefore, won't the magnetic force of the magnets be shut off alternately so that the pendulum is kept swinging perpetually?

Don't write more than 300 words, and be sure to mail the letter before June 15, 1932.

Address your letter to the Magnet Pendulum Editor, Modern Mechanics and Inventions, 529 S. Seventh Street, Minneapolis, Minn.

"SCIENCE RACKETS"

These Havasupai women are making "antique baskets" which will be stained with transient dyes, buried for a few weeks, and dug up and sold as ancient relics for high prices.

The colored glass bottle racket, in which the sun is supposed to change plain glass into all colors of the rainbow, is one of the best and most profitable on the desert.

"Archeology" relics supposedly dug from ancient ruins, but in reality manufactured by modern Indian women—the lost gold mine racket—these are typical of the scientific frauds perpetrated on unwary American desert tourists by a new brand of racketeer.

PAVEMENTS and automobiles, maps and planes, air-cooled cars and tractor-borne water-tanks, have given to the American desert as many "rackets" as have been devised in any city of this country.

Most of these rackets lay claim to a scientific background of one sort or another, cashing in on the smattering knowledge the average tourist has of archeology, natural history and geology. There's the colored bottle racket, which depends for its appeal on the fact that glass, exposed to the burning rays of the desert sun, turns brilliant purple or pink.

Then there's the ever-popular archeology racket in which bowls and glassware, supposedly dug from ruins left by ancient peoples, are sold for fancy prices regardless of the fact that they are turned out at insignificant cost by Indian women or Mexican factories.

New and novel, these "rackets" differ from those of the cities only in kind; in variety, they are even more numerous, and in originality they eclipse the sale of Brooklyn bridge or the city hall, though they still include gold-bricks as one of their mainstays.

The Grubstake Racket

Out of a barren, rocky gorge, near Randsburg, in the winter of 1931-32, came a three-burro team, hauling a broken-down, canvas-covered wagon, driven by a bearded desert rat, who halted at the appearance of an automobile carrying four men. Conversation disclosed four or five hundred pounds of gold-laden rock in the wagon.

There was no need to start a gold-rush,

of the DESERT

by H. H. DUNN

In the grubstake racket, the prospector with a wagon load of rich ore sells a half interest in his newly discovered "mine"—and disappears. At right, a spiny lizard, easily caught, sells for upwards of $2 to women desiring a curious pet.

so the four men produced $300, gave it to the prospector, took his ore in their machine, and agreed to meet him at the same point, three months later. He never reappeared. This was a form of the grub-stake racket, worked to the number of a score and to a total of probably $25,000 by forty or fifty men on the desert every year.

This is kindred to the lost-mine racket. There are a minimum of 29 apparently authentic lost mines of legendary richness on the desert in Arizona, Nevada, Utah, Colorado and Eastern California. Automobiles and airplanes carry enough men of means into the desert every winter to make it worth while for prospectors, real and otherwise, to promote expeditions in search of these vanished glory holes. During the last winter, nine such expeditions have gone out from Los Angeles, San Bernardino, Santa Fe, Tucson, Phoenix, El Paso, and other points of proximity to the desert. Not less than $2,000 was spent on the outfitting of each, while probably the actual amount was nearly twice this sum.

Lost Mission Treasures

Buried in a waste of sand, far down on the Colorado River, lie the ruined walls of the Missions of Saints Peter and Paul, destroyed by raiding Indians a century or so ago. In the fall of 1931, five men in Los Angeles "invested" $5,000 in an expedition to find the "treasure" alleged to have been buried by the unfortunate priests, just before they met death at the hands of the Yumas.

This little pot of cacti, worth 50 cents, sells for $3. One cactus racketeer sold more than 600 of them during 1931.

This is the seventh similar expedition to the same place, engineered by one desert guide to his own profit. Aside from the facts that the priests in these poverty-ridden Missions had no treasure, and, if they had, would not have had time to bury it, the story is true. Indeed, there is hardly one

Desert Silkworm, Eating Dyed Leaves, Supposed to Produce Colored Silk

This apparatus was used by a promoter who claimed to have invented a method of making silkworms spin colored silk by feeding them dyed mulberry leaves. His silkworms were supposed to thrive especially well in the desert.

Distinctive glazed pottery of this type is made only in the village of Guadalupe, just outside Mexico City. Yet desert tourists buy these pieces, worth 50 cents, for $5 to $25 in the belief that they come from mysterious pueblo ruins.

of the 18 Mission sites in Lower California, or of the 21 in the state of California, which has not been prospected, at considerable expense, for treasure, none of which has been found.

Hal Drexler, a young man who grew up behind a counter in New York, was warned ten years ago that he must seek a drier climate. With his total capital of $200, a tent and a few cooking utensils, he went to south-central Arizona. There he set up housekeeping, alone, near a water-hole and 30 miles from his nearest neighbor. In long walks over the desert, he found the ruins of a prehistoric Indian town.

1932 Model Antiques

There he gathered pottery, clay figurines, idols, skulls, spearheads and arrow-points, which he sold to travelers along the new highway, and so lived for two years. Then, government stepped in and made a reserve of the ruins. Drexler hired a few Pima, Maricopa and other Indians to make pottery, idols, clay figures and so on, which he baked, buried, dug up, and continued to sell to tourists. Today, he lives in comfortable retirement in a southern California city, where his neighbors consider him an authority on the archeology of the Southwest.

Along these lines, there is the enterprising young man who makes better arrowheads out of flint, obsidian, agate, or whatever material is the "best seller" at the moment. He chips with a steel tool of his own devising more symmetrical arrowheads than any Indian ever made, and sells them at 50 cents to $1 each, depending on the eagerness of the customer to buy these artifacts, "found in a prehistoric Indian tomb."

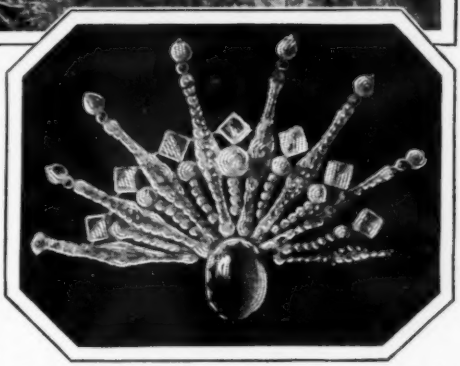
Stone Gods Carved to Order

Another man, who might have been a competent archeologist, employs Mexican Indians to carve stone "gods" in imitation of those actually found in tombs, and distributes them through the towns of the Southwest. His is a high-grade racket, since he receives from $5 to $25 each for his "antiquities," which cost him about 50 cents each, exclusive of distribution cnarges.

Drexler estimates that there are at least 25 separate and distinct rackets on the desert; that not less than 30,000 men and women make a living from them, and that there is not a township accessible to automobiles in the desert states that does not support from ten to one hundred of these opportunists of the wastelands. One of the best is the colored-glass game. Alongside many of the service stations, beside lonely

More Money Spent in Seeking Lost Mines Than Ever Came Out of Them

The lost mine racket is always good on the desert. There is no authentic record of any of these lost mines ever being discovered, but approximately half a million dollars is spent in searching each year in various parts of the desert.



Sold as an Aztec head-dress for $750 with the story that it came from an ancient cliff-dweller's tomb, this ornament was actually manufactured by a New York jeweler for $5.

cabins on desert roads, and in all the towns, the traveler sees rows of bottles of every size and shape, laid out in the sunshine, turned frequently, and guarded closely.

In about six months from the time they are put out, these bottles begin to show colors, from azure to yellow. Then they are offered to train and motor tourists at $5 to $20 each, with individual stories of the years they have been in coloring. Better bottles, with more enduring colors, may be bought in the home-town glassware store for $1 to $3, but one enterprising bottle merchant, on a Death Valley dirt road, sold 402 of these at an average price of $7 each, in 1931. The bottles cost him about 7 cents each, and six months of summer sunshine, for which he received no bill.

Indian Actors Come High

In days gone by, renegade white men, usually married to squaws, led raiding bands of Pah-Utes, Apaches and other Indians against the caravans of the American desert, but the airplane and the automobile, carrying sheriffs and their posses, have put an end to that. Today, white men organize bands of Indians for motion pictures, sometimes whole tribes of them.

One motion picture company went into location in New Mexico, last year, with the idea that it could get plenty of Indians by dealing directly with the chiefs. But not an Indian would move until "released" by a white promoter. The film corporation paid this man a little better than $25,000 and food costs, for the services of some 300 Indians for five days. After the promoter had pocketed the "fee," he naively told the director that the Indians would have been supplied at $5 a day each, "if advance negotiations had been made."

The "spineless-cactus racket," which cost hundreds of unsuspecting farmers hundreds of thousands of dollars, has passed out, but on almost any desert highway, one will find shops devoted to the sale of "cactus gardens," made up of small leaves and plants, stuck into sand in clay pots. For these, the desert merchant asks and gets $3 to $5, undeterred by the fact that a better pot, with more and larger cacti in it, well rooted, may be purchased from almost any city florist for one-third his prices. Jim Dreyfuss, who claims to have originated this racket, sold 748 of these little pots, at an average price of $4, from two stands on an Arizona highway in 1931. He admits they cost him less than 30 cents each, labor included.

The cactus-candy business has grown

into an international affair, with sugar-crystallized leaves and stems, and canned or sweet-pickled fruits, as the main commodities. This product brings from $1 to $2 a pound, according to whether it is bought along the roadside or on the train. Its actual cost, says Arthur Bowen, engaged in it, is about 20 cents a pound.

Early in the fall of 1931, a bewhiskered individual—it appears that one must have whiskers as accessories to success in desert rackets—called on the writer, offering to sell his "discovery" of a cliff-dwelling in California. There are no genuine cliff-dwellings, so far as known, in this state, so the archeological value of such an antiquity would be great. This desert rat wanted $500 for his services as guide, $500 more if and when we arrived at the ruin, and all expenses on the round trip of about 500 miles. Before he left, he dropped the price to $2 a day and his food, for whatever length of time we might be engaged chasing this archeological rainbow. Unless he built the stone walls himself, in the entrance to some remote cave, he had no cliff-dwelling to show, but it would have been interesting to learn just how he would extricate himself from his failure to find the ruin.

Tombs for $10 a Day

The "guide racket" furnishes what appears to be profitable employment to several hundred men, and a few women, on the desert. They infest the towns, and will show the tourist anything he wants to see—from a "tomb greater than King Tut's" to a Gila monster—at an average price of $10 a day and expenses. One of these smart lads "found" and sold for $750 to an eastern archeologist, an "Aztec head-dress," supposedly taken from a burial pit near the famous Casa Grande ruin. Later developments showed that it was made by a costume-jeweler in New York, aged with vinegar and salt, buried in a cremation site, and, to make the picture complete, actually dug up by a Pima Indian.

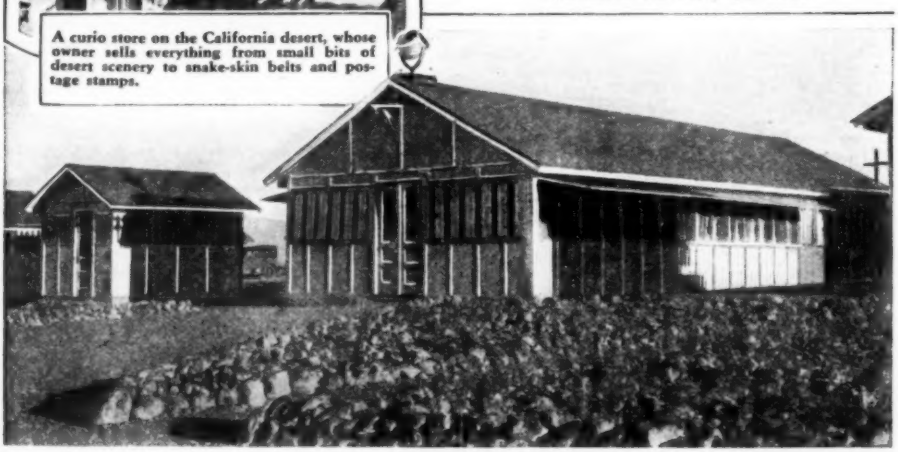
"Tame" Snakes as Pets

A rusted but nearly complete suit of armor, supposed to have belonged to a Spanish adventurer of 1550 or thereabouts, was produced by a desert guide from the accumulated ashes of a Utah cliff-dwelling. He received $2,500 from the agent of an European museum for it. As a matter of fact, it was a rather poor copy of a suit which had been for some years in a museum in Mexico City.

About 200 men in New Mexico, Arizona, southern Nevada and southeastern California devote their time and talents to the snake racket. They sell snakes, lizards, tarantulas, centipedes and other curious forms

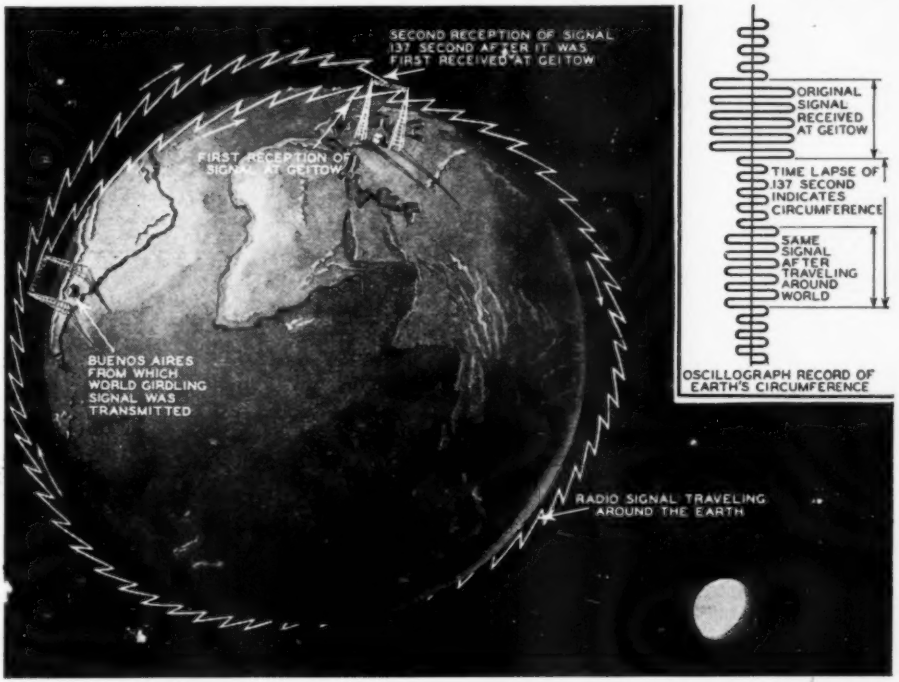
(Continued on page 181)

A curio store on the California desert, whose owner sells everything from small bits of desert scenery to snake-skin belts and postage stamps.



Curious indeed is the bungalow racket. This photo was taken in a corner of Death Valley, and shows one of the 50 bungalows rented to those who yearn to dwell, for some time at least, in this barren sand plain, for no apparent reason.

Earth-Girdling Wave Tests Limits of Radio


SECOND RECEPTION OF SIGNAL 137 SECOND AFTER IT WAS FIRST RECEIVED AT GEITOW
FIRST RECEPTION OF SIGNAL AT GEITOW
BUENOS AIRES FROM WHICH WORLD GIRDLING SIGNAL WAS TRANSMITTED
RADIO SIGNAL TRAVELING AROUND THE EARTH
ORIGINAL SIGNAL RECEIVED AT GEITOW
TIME LAPSE OF 137 SECOND INDICATES CIRCUMFERENCE
SAME SIGNAL AFTER TRAVELING AROUND WORLD
OSCILLOGRAPH RECORD OF EARTH'S CIRCUMFERENCE

A radio wave sent from Buenos Aires was received at Geitow, near Berlin, and .137 second later was again picked up by the Geitow station, after circling the globe, giving handy "measuring tape" for earth's circumference and proving radio sets cannot be made super-sensitive without picking up echo signals, which would be out of phase, causing distortion.

THE fact that modern radio tubes have been developed to practical limits of sensitivity was strikingly demonstrated recently when a short-wave radio impulse was sent around the world and picked up on its return journey after a time interval of .137 second.

Obviously, if radio tubes are made much more sensitive, they will pick up an echo of the original signal which, coming a fraction of a second later, would be out of phase and would result in bad distortion.

A station at Geitow, Germany, near Berlin, and one in Buenos Aires were used in the striking experiment illustrated in the drawing above. Study the graph, which is an oscillograph record of the earth-girdling message. The Buenos Aires station sent out the message, consisting of a single dot, on a wave length of 15.66 meters. The dot was received at Geitow, and exactly .137 second later the same dot, in diminished intensity, was recorded at the same station.

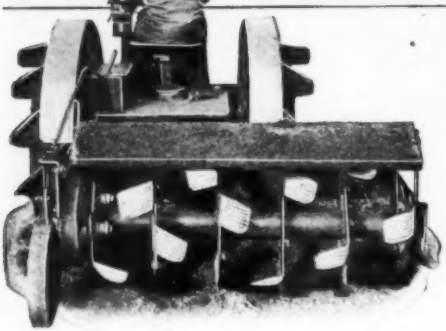
The time separation of .137 second indicates the time required for the signal to circle the earth, and figuring a rate of 186,000 miles per second, this interval enables the circumference of the globe to be checked up by radio tape measure. This is the first proof that radio waves can over-lap.

New Stockings Made Like Gloves

GLOVE stockings are the latest novelty to enter the field of feminine style. As shown in the photo below, the stockings are shaped to fit over the toes and are designed particularly for use with sandals during the warm weather season. The idea emanates from Paris.

Latest boon to hosiery manufacturers is the glove stocking, shown above, to be worn with sandals in warm weather.

Cultivator Does All Soil Processing Jobs



Rear view of the plow, showing rotary blades on disks which pulverize soil by hurling it against upper board.

The work of taking soil from the ground, pulverizing, aerating, mixing and spreading is all done by this new plow.

THE answer to the farmer's dream has just been successfully demonstrated in England. The "answer" is a rotary cultivator plow which, in one operation, pulverizes the soil, aerates it, assists it to conserve more moisture, cuts up any surface growth into small pieces, and mixes the soil evenly to assist fertilization.

The disks of the plow, shown above, loosen the soil which is taken from the ground and hurled against the board above by the blades on the disks. Aeration is accomplished by the resulting spray. The soil is completely mixed in the process. Above photo shows the cultivator in action behind a tractor. Note the soil spray.

How to Treat Heat Prostration

TWO different kinds of heat prostration may occur in hot weather. Both are dangerous to life and everyone should know how to distinguish between them and how to apply relief until a doctor comes.

One of the two conditions is heat stroke, sometimes called sun stroke. The victim of a heat stroke is unconscious and his face and skin are red and hot to the touch. The proper relief is to keep him cool and pour cold water on his face and body.

The other kind of heat prostration is heat exhaustion and shows symptoms almost opposite. The victim's skin is cold and clammy. He is not necessarily unconscious, but is weak and prostrated. The patient should be kept warm, laid down in a comfortable place, covered with blankets and warmed, if necessary, by hot water bottles.

Many victims of summer heat probably are killed because bystanders apply the wrong remedy. In either case, get an ambulance or a doctor as quickly as possible. Delay is often fatal.

Mouth Harpist Goes to Extremes

JUST because he "slides over" a lot of notes going from low "G" to high "C" gives Fred Leslie, London musician, the right to claim the title of world's champion mouth harpist. His mammoth instrument measures 36 inches from tip to tip. He also plays the one-inch organ shown perched on "Big Bertha" in the photo below.

The musician certainly has a mouth full when he plays this mammoth 36-inch organ. He is shown sounding his "A."

Electric Camera Photographs Walls of Human Stomach

A NEW wonder in photography that will take pictures of the innermost recesses of the human stomach has recently been developed by three doctors of the University of Vienna. This amazing device, shown on the right, takes eight pictures simultaneously.

The new camera is contained in a tube ½ inch in diameter and three inches long. The powerful light is operated by a battery with cables running down the throat to the filament, as shown in the drawing.

Above and below the light source are eight cameras of the pin-hole type. Pinholes, which take the place of the customary glass lenses, are made of platinum foil and measure from 1/800 to 1/500 of an inch in diameter.

The film used is of a very fine grain, and although it is only ¼ x ½ inch in size, such sharp pictures can be taken that enlargements of 45 x 107 mm. are possible. The camera in use is no more unpleasant than having one's stomach pumped.

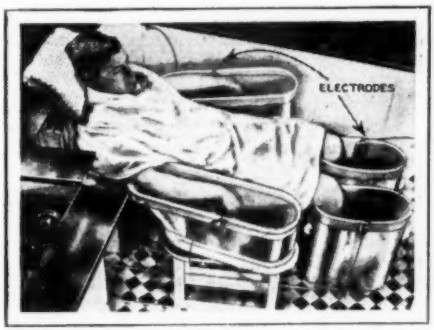
This new stomach camera takes eight pictures simultaneously on negatives measuring but ¼x½ inch. Such sharp pictures are taken that 45x107 mm enlargements can be made.

Electric Bath Fights Disease

SOME London hospitals are now equipped with the latest in scientific methods of combatting disease, the electro-therapeutic bath.

The diseased patient sits comfortably, as the photo below shows, with his hands and feet in small tubs. The artificial fever is produced in the body by the passage of an electric current which combats the disease germs and hastens recovery.

The electric current is run into the solution in the tubs through electrodes. The intensity of the current can be altered by rheostats on the control board shown in lower left corner of the photo.



An artificial fever is created by passage of current through the solution in which the patient rests his hands and feet.

Processed Metals Rival Steel

MANY metals hitherto mechanically inferior to steel may now be brought up to the standard of steel in hardness and strength through a process known as "age-hardening." Copper, lead, zinc, nickel, tin and aluminum respond to this treatment.

Clock Turns on Light at Time Set

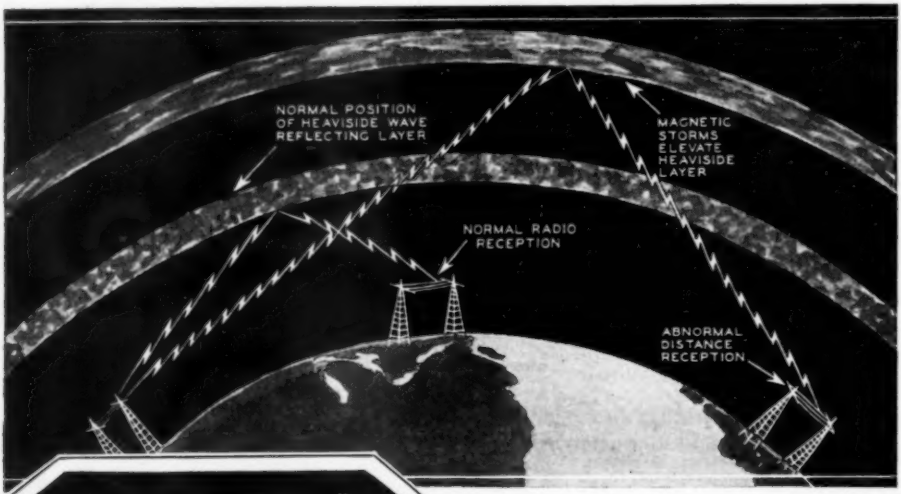
POLICE have found that most of the homes that are broken into after dark are those in which no lights are on. Here is a device that will switch on your lights while you are away.

Make a wire holder to slip over the light switch. On this hang an alarm clock with a length of string fastened around the alarm key, through the ring, and around the wire holder exactly as shown in diagram.

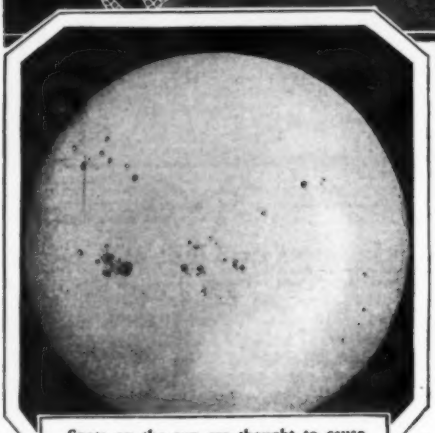
When the alarm goes off at the time set, the key revolves, winding up the string and pulling the clock along the wire until its weight pulls the holder down to a vertical position, which turns the switch and snaps on the lights.

Turning alarm key winds the string, causing the wire to turn switch till light is snapped on.

Magnetic Oddities of the


NORMAL POSITION OF HEAVISIDE WAVE REFLECTING LAYER
MAGNETIC STORMS ELEVATE HEAVISIDE LAYER
NORMAL RADIO RECEPTION
ABNORMAL DISTANCE RECEPTION

Magnetic storms, affecting the level of the wave-reflecting Heaviside layer, sometimes cause the phenomena illustrated above, in which distant radio stations are heard clearly and near-by ones, normally sharply audible, cannot be received.



Spots on the sun are thought to cause magnetic storms on the earth which disrupt radio and telegraph communication.

This is what the north magnetic pole on Boothia peninsula looks like. The hut stands approximately on the pole.

THE story is told of the great American astronomer Simon Newcomb that while engaged in supervising the scientific definitions for a new dictionary he objected to the definitions of "magnet" and "magnetic force" submitted to him. The editor asked him to try his hand at framing something better. After alternately writing and erasing for an hour or more, the astronomer, with a hearty laugh, handed in the following: *"Magnet.* A body capable of exerting magnetic force." *"Magnetic force.* The force exerted by a magnet."

Magnetism's Nature a Mystery

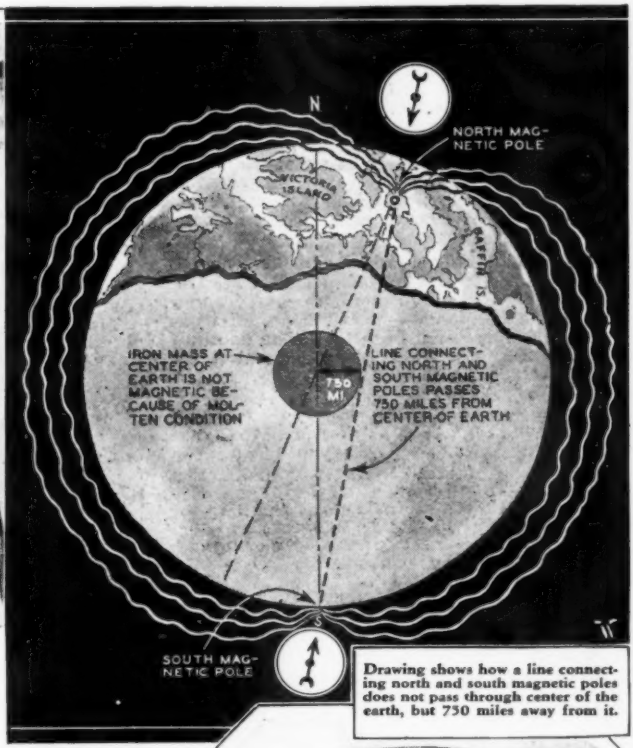
This anecdote illustrates the fact that nobody is wise enough to say just what magnetism is. We know, however, a great deal about how it behaves, and because of this knowledge we recognize that the planet on which we live possesses magnetism. The classic announcement that "the terrestrial globe is a great magnet" was made by the English philosopher Gilbert in the year 1600, and that statement was the starting point in a long series of revelations concerning the magnetic properties of the earth that have since been unfolded.

Because of its action in directing compass needles, and for several other reasons, the earth is known to be magnetic, but there is still much uncertainty about the nature and cause of its magnetism. There are several known regions of the earth—such as the island of Bornholm, in the Baltic Sea—

Globe We Live On

by CALVIN FRAZER

Above, observing magnetic inclination with dip circle. The observer is a member of the Byrd Antarctic Expedition, which collected much data on south polar magnetism, never before available to scientists.


N
NORTH MAGNETIC POLE
VICTORIA ISLAND
IRON MASS AT CENTER OF EARTH IS NOT MAGNETIC BECAUSE OF MOLTEN CONDITION
750 MI.
LINE CONNECTING NORTH AND SOUTH MAGNETIC POLES PASSES 750 MILES FROM CENTER OF EARTH
SOUTH MAGNETIC POLE

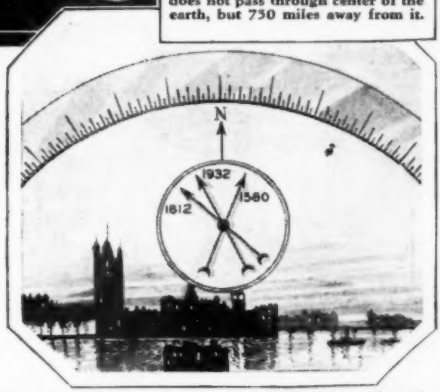
Drawing shows how a line connecting north and south magnetic poles does not pass through center of the earth, but 750 miles away from it.

where there is an intense local attraction of the compass, and this is supposed to be caused by deposits of magnetic iron ore. We have good reasons for believing that the central core of the earth is an enormous ball of iron, thousands of miles in diameter. If this core were cold we might suppose it to be magnetized, in which case its presence would explain, at least in part, the magnetic phenomena observed at the earth's surface, but it is believed to be intensely hot, and ordinary iron loses its magnetism when heated.

Earth's Core Not Magnetic

Some theorists have suggested that the core might be magnetic, in spite of its heat, on account of the tremendous pressure to which it is subjected, and some experiments for testing this theory have recently been carried out at the Geophysical Laboratory in Washington. Magnetized iron under a pressure of 29 tons to the square inch was heated to 1,650 degrees Fahrenheit. Its magnetism vanished entirely before this temperature was reached.

The evidence is therefore against the idea that the earth is a "permanent" magnet, similar to the familiar bar or horseshoe magnet, and it now seems more plausible to assume that it is an electromagnet, owing its magnetism mainly to electric currents flowing in and about it.



Proof that magnetic poles constantly shift is found in variations of London compass needle in 1580, 1812, and 1932.

As compared with any of the small mag-

Magnetic Observations Are Important in Study of Sun and Electricity

nets constructed by mankind, the earth is extremely complex in its magnetic manifestations and these are subject to incessant changes. Its magnetic poles — the places where a "dipping needle" stands straight up and down and the ordinary compass needle ceases to be subject to any directive force—are 1,200 miles or more away from the geographical poles, and they undergo gradual displacements. One is now in Boothia Peninsula, in northern Canada, and the other in South Victoria Land, in the Antarctic. These poles are not diametrically opposite to each other, as are the geographic poles; the line joining them passes some 750 miles away from the center of the earth.

Magnetism Expressed in Three Directions

The distribution of magnetism over the earth can be expressed in terms of three magnetic elements — declination, inclination and horizontal intensity. The declination is the angle that the compass needle, at any place on the earth's surface, makes with the geographic meridian; the inclination is the angle that the dipping needle makes with a horizontal plane, and the horizontal intensity is the portion acting horizontally of the total intensity of the earth's magnetism at any place. Of these three elements the declination is most familiar, as it is constantly used by navigators and surveyors in correcting compass readings so as to obtain true directions.

Charts Are Important

One of the big jobs of modern science is to obtain, with the aid of a good-sized army of observers, measurements of these elements in all parts of the world for use in compiling magnetic tables and charts, and such measurements have been made at a vast number of places by land and sea, including upwards of 5,000 places in the United States alone.

As far back as the end of the 17th century the English astronomer Halley made two long voyages in order to collect data of magnetic declination on the ocean, and in our own times the famous yacht *Carnegie* (constructed of non-magnetic materials and hence described by some wit as the most *unattractive* vessel in the world) cruised more than 300,000 miles in quest of magnetic data up to the time she was destroyed by fire in Apia harbor on November 29, 1929.

Data Never Up-to-Date

Unfortunately this great task of surveying the earth's magnetism can never be even approximately complete, because the values of the magnetic elements are constantly changing in all parts of the world. These changes are, moreover, both complex and irregular.

There are, first of all, the slow, progressive changes known as secular variations that persist for many years in one

(Continued on page 174)

South magnetic pole is in Victoria Land in the Antarctic. Photo shows members of Byrd expedition making studies there.

Measurements of earth's magnetism at various spots are constantly being made, since magnetism varies with time and season. At left, scientists are reading a magnetometer; at right above is shown a portable hut used in making observations.

Make Street Intersections PAY a PROFIT

RECORDS show that busy street intersections are the favorite spots in which traffic accidents occur. To eliminate these danger spots, J. G. Van Zandt, an engineer of Pittsburgh, Penn., has patented the idea of a safety-tower which practically eliminates the possibility of crossing collisions and at the same time returns a profit to the community.

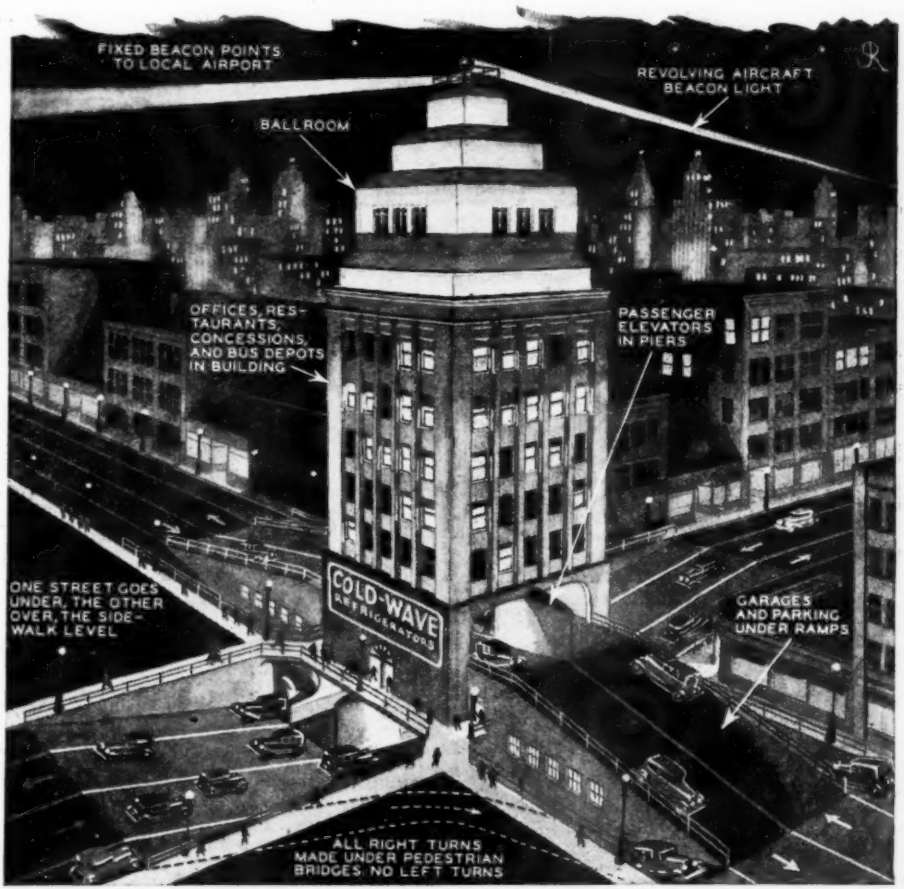
Space above and below street level at intersections belongs to the city. Mr. Van Zandt's towers would be constructed at the intersection, as shown in the drawing below, and would contain stores, offices, and parking facilities which would return a handsome revenue to the builders.

The safety feature is provided for by the two-level roadway. North-south traffic travels on one level, with east-west traffic passing above it, doing away with the need for stop and go signs, since traffic is continuous. Crossings for pedestrians are provided at street level; autos travel below and above the street, but not on its surface at the intersection.

Motorists making right turns pass underneath the pedestrian bridges. Left turns are not permitted. Parking facilities are provided for beneath the street level.

Revenue produced would depend largely on conditions at individual intersections. In many cases, Mr. Van Zandt believes, small cities can well afford to construct a safety-tower as a civic center building, satisfying local needs for city hall, banquet halls, public rest rooms, etc.

It is a simple matter to locate an air beacon on the top of the tower.


FIXED BEACON POINTS TO LOCAL AIRPORT
REVOLVING AIRCRAFT BEACON LIGHT
BALLROOM
OFFICES, RESTAURANTS, CONCESSIONS, AND BUS DEPOTS IN BUILDING
PASSENGER ELEVATORS IN PIERS
COLD-WAVE REFRIGERATORS
ONE STREET GOES UNDER, THE OTHER OVER, THE SIDEWALK LEVEL
GARAGES AND PARKING UNDER RAMPS
ALL RIGHT TURNS MADE UNDER PEDESTRIAN BRIDGES. NO LEFT TURNS

This safety-tower, to be constructed at street intersections, reserves street level for pedestrians and permits cross traffic to flow continuously, without regulation of stop and go signs. Rental of parking space, offices, and stores would return sufficient revenue to pay a profit on the tower's construction. This unique idea has been patented by J. G. Van Zandt.

Zipper Traveling Trunk Gives Passengers More Room

Coats and other items used often on your trip can be packed to advantage in this zipper trunk since they can be taken and replaced without disturbing other bags.

IT TAKES a lot of the joy out of traveling in your car when you have to ride in crowded quarters. The photo on the left shows a new zipper traveling trunk designed to make motoring more enjoyable for tourists.

The trunk is fitted to the back of the front seat replacing the usual robe rod, and is big enough to accommodate a large part of your wardrobe.

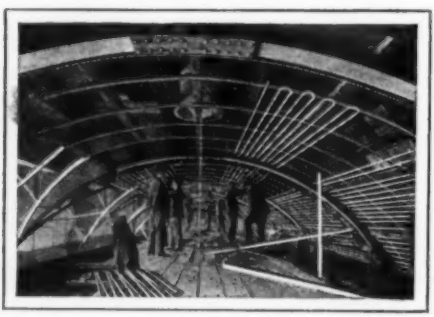
Opening from the top, as it does, makes the trunk a convenient place to pack your coats and other articles of clothing used frequently on the trip.

Heating With Invisible Pipes

INVISIBLE heating, which has been used successfully in England for some time, has made its appearance in a New York home.

The system is known as radiant or panel heating and differs from convection heating—now in general use, where the air is warmed by contact with exposed pipes or radiators—in that the heat is radiated by rays from the hot water coils that are embedded in the walls and ceiling. A special, non-crackable plaster is used.

In addition to eliminating radiators and registers, it is claimed that this system effects a saving of one-third in the amount of fuel used and makes adequate humidity possible at all times. Air is practically unaffected by this radiation and is not appreciably warmed by it.

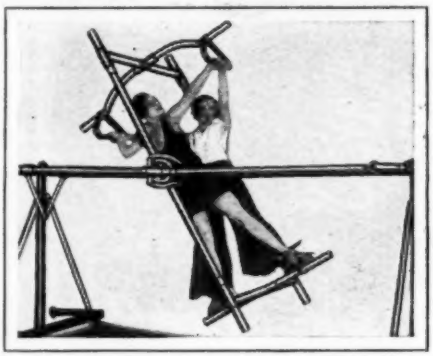


Hot water coils are embedded in the walls and ceiling in a special non-crackable plaster. Rooms are heated by heat waves from coils instead of radiators or registers.

Exerciser Develops All Muscles

EVERY muscle in the body is brought into action when you start swinging on the exerciser shown below, which can be operated by one or two persons.

The "gyro wheel", as the device is called, is designed to revolve in all directions and is made entirely of metal. The direction and movements of the wheel are controlled by the movements of the body.



Exerciser is pivoted on the support rod so that it can be swung in any direction by the body movements of the person or persons operating it. Builds every muscle.

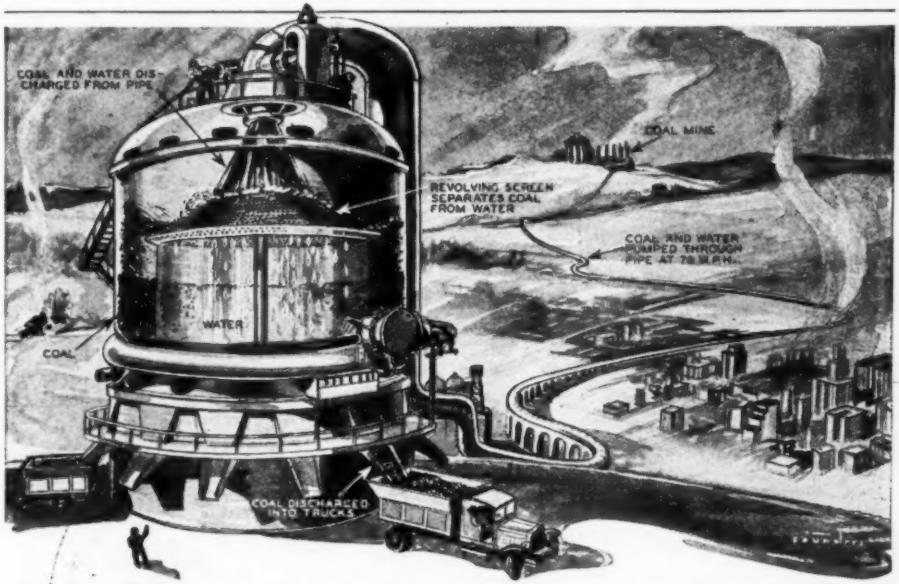
Ten Drugs to Avoid in Medicines

THERE are ten drugs often contained in patent headache medicines which are so dangerous that every purchaser should look carefully for them on the label before buying or using the remedy.

Three are opiates, including opium, morphine and heroin. All three may cause the drug habit and should only be used under direct supervision of a competent physician. Three more habit-forming drugs are cocaine, and the similar drugs, alpha eucaine and beta eucaine.

Chloroform, the anesthetic, cannabis indica or Indian hemp, an oriental drug, chloral hydrate, used in the infamous "knock-out drops", and acetanild, which has a powerful depressant action on the heart and blood circulation, complete the list.

COAL *Costs Cut by Water-Pipe Shipment*


COAL AND WATER DISCHARGED FROM PIPE
COAL MINE
REVOLVING SCREEN SEPARATES COAL FROM WATER
COAL AND WATER PUMPED THROUGH PIPE AT 75 M.P.H.
WATER
COAL
COAL DISCHARGED INTO TRUCKS

Coal could be transported at 75 m.p.h. by grinding it to pea size, mixing with water, and pumping through pipe lines from the mine, in a scheme advanced by Reginald Bolton, New York engineer. A station similar to that shown above would separate the coal from the water at the receiving end. Coal could be piped from Scranton to New York in 2½ hours.

MOST of the selling price of a ton of coal represents the cost of transporting it —up out of the mine, across country to big cities, thence to small distribution centers, and finally to the consumer. But the day may soon come when coal will be *piped* from the mines to the city, at amazing savings in transportation costs.

If this idea sounds fantastic, consider the fact that most of the oil produced in this country is transported from well to refinery by pipe line. Coal, pulverized and mixed with water, can be moved through pipes just as efficiently as oil.

At the International Bituminous Coal conference recently held at Pittsburgh, Pa., Frederick Schulte suggested mixing powdered coal with air and pumping it through large pipes at a speed of 90 miles an hour. Laboratory experiments proved that speeds of 100 miles an hour could be attained by this method without difficulty.

Air as a carrying medium, however, is objectionable because of the possibility of explosion, so sponsors of this project are now experimenting with inert gas instead of air. Nitrogen, for instance, is plentiful and inexpensive, and would eliminate the danger of explosion.

Simpler yet, Reginald Bolton, a consulting engineer of New York, would grind the coal to pea-size and use water to pump it through pipe lines. At the receiving end, water would be drained from the coal as shown in the drawing above.

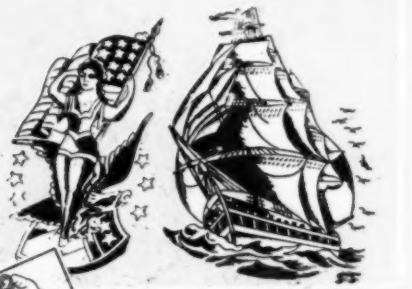
Machine Tells Your Brain Speed

IS YOUR brain and nervous system clicking at top speed? Here's a machine that will tell you in a hurry. On a revolving cylinder are 20 questions taken from standard intelligence tests. Each question has alternative answers, and during the moment the machine stops for each question you must answer by pulling a lever.

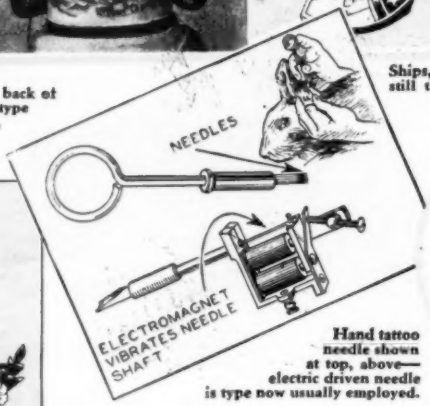
On a cylinder inside this machine questions with alternative answers are arranged, to be answered by pulling a lever.

Modern Methods Improve

Percy Waters tattooing the back of a subject, using the latest type of electric tattooing needle, as shown in the drawing at right, below.



Ships, girls, hearts, and anchors are still the most favorite tattoo patterns.



Hand tattoo needle shown at top, above—electric driven needle is type now usually employed.

Some favorite tattoo patterns. Ship's anchors are always popular.

TATTOOING is one of the most ancient arts in the world. Even before man had learned to write—and centuries before he could print—he practiced the art of pricking various designs and symbols and pictures into the human skin.

Down through the ages men and women have tattooed themselves for a wide variety of reasons. Early tribes tattooed their faces to make themselves appear more ferocious and powerful in battle. Other tribes tattooed their whole bodies as a protection from the rays of the sun and from the eyes of their enemies. Then the custom sprang up of tattooing the various parts of the body for religious purposes, or to show membership in a certain family or clan, or to make themselves more attractive to the opposite sex, or as evidence that a youth had reached the marriageable age.

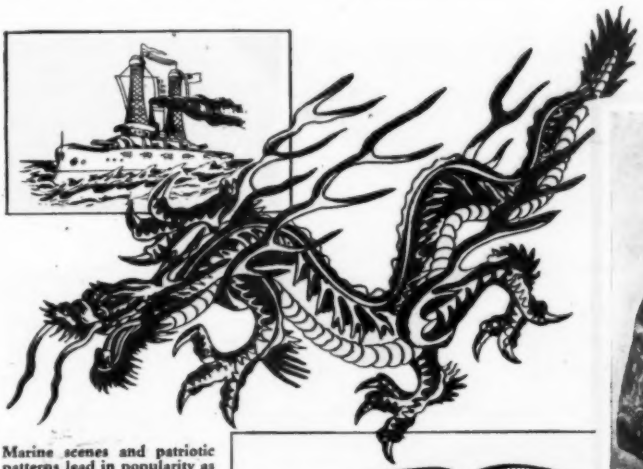
Electric Needle Modern Tattooing Method

Although most of these strange customs have disappeared, the art of tattooing remains and is practiced today in every country of the world. But until comparatively recent years, tattooing was done by the same crude methods used in Biblical days. This consisted of jabbing the skin with some sharp instrument or needle and thus pricking the indelible colors under the surface of the skin by means of hundreds of tiny pricks.

In recent years, however, modern science has completely revolutionized this ancient art by the introduction of the electrical tattooing machine. This modern tattooing implement resembles in size and shape an Eversharp pencil or a dentist's drill. At the tip of the "pencil" is a cluster of four or five very thin needles. These are fastened to a small drive shaft and connected with a vibrator of the make-and-break principle of an ordinary door bell or buzzer. When the machine is in operation the cluster of needles darts out and back at the rate of several hundred times a minute.

Ancient TATTOOING Art

by **WILLIAM H. STOCKWELL**



Marine scenes and patriotic patterns lead in popularity as tattoo subjects. Designs similar to those shown here are stenciled on the skin with crayon sauce. Then the electric tattoo needle is dipped in pigment and the design permanently outlined. Tattoo needles dart in and out rapidly, carrying color just under the surface of the skin. A flexible spring allows needles to "give" when they strike the skin; thus the subject feels no pain, in the process.

The entire skin area of the body can be covered with tattoo designs, as shown, without danger to subject.

This electric tattooing machine in the hands of a skilled operator will draw a pattern in the skin with practically no pain to the customer and no drawing of blood. The needles do not go straight down like those of a sewing machine; a flexible spring allows them to "give" when they strike the skin, and the skin also yields a bit to allow the ink to be worked in just under the surface.

Needles Work So Rapidly Subject Feels No Pain

Thus modern science makes it possible for the tattooer to trace his pattern on skin just as he would draw on paper with a pencil. The tiny needles dart in and out so rapidly that there is no jagging or tearing of the skin. The customer feels no soreness after two or three days and the skin is completely healed up in about a week's time.

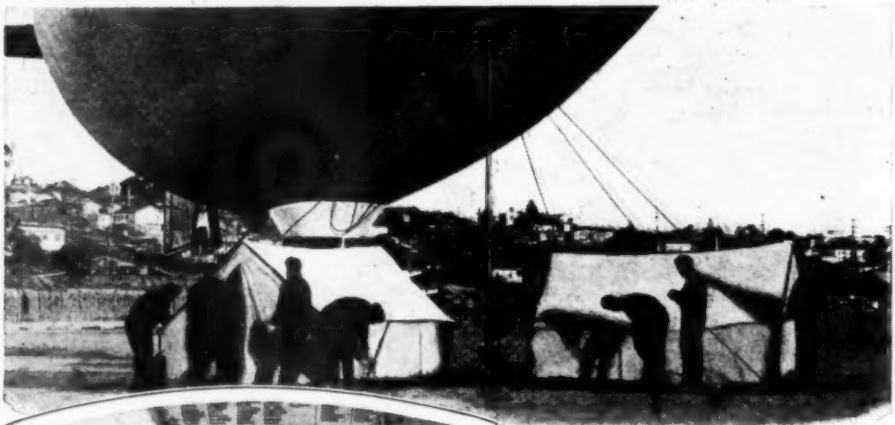
Expert tattooers say that the speed of the needle is the most important detail of modern tattooing. After the arm has been prepared by shaving and washing it and the stencil has been put on by means of crayon sauce, the operator turns on the machine and listens attentively to the hum of the vibrating needles. He can tell by the feel of it whether the vibrations are right for clean, smooth work. Then he dips the needle into the color and draws the ink up into the instrument, and when the needle touches the skin this ink flows down and dyes the tissue just underneath the surface. A salve or ointment is put on as a final step and the skin is bandaged for a few days.

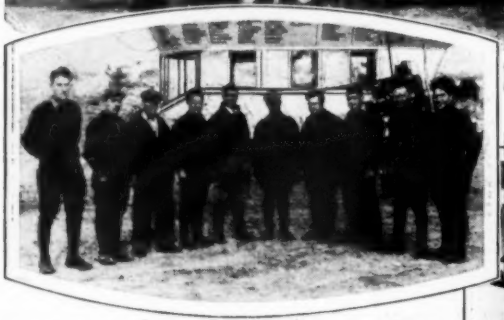
It is interesting to note that human skin varies greatly in thickness and tenderness. The skin of a young person is easier to tattoo on than that of an older person, and blondes are easier than dark-haired people. With the aid of the electrical

(Continued on page 188)

A few more popular patterns.

Adventures of Mechanics in





Here are ten of the 15 vagabonding airmen required in manning the blimp, an airplane and the three automobiles of the ground crew on the trans-continental jaunt.

At end of each day's flight, the blimp was moored to the portable mast, shown in the photo above, while the crew pitched camp under the ship's nose.

Lieut. McCracken, chief pilot on the barnstorming trip, signals to the ground crew to cast off for next leg of flight.

by JAMES BOWLES

Freak adventures were the daily lot of a baby blimp's crew which recently barnstormed the country from coast to coast. Here the skipper tells how mechanical ingenuity pulled the big bag out of many tight places on the long jaunt.

WHEN Maj. A. J. Wadsworth and his associate pilots walked their baby blimp out of the hangar for their recent barnstorming jaunt across the United States, little did they dream of the extraordinary adventures awaiting them. And little did they dream that on their pilgrimage from Wilmington, Del., the starting point, to San Francisco, their destination, they would have need of all the mechanical ingenuity they could muster up.

From the time the big bag left the Atlantic till it slid down the western edge of the Rocky Mountains, the crew was constantly at the mercy of the elements, which meted out to them a series of the most unusual adventures in the annals of aeronautical history.

Much as an army unit on the march the blimp, after taking off in the morning, would find itself bracketed by two ground crews. One remained at the take-off point to give aid in case the blimp was forced to return, while another speeded ahead to haul in the big bag at the end of the day's journey. On a few occasions the blimp, driven back by storms, was compelled to seek refuge at its home port of the night before.

a BARNSTORMING BLIMP

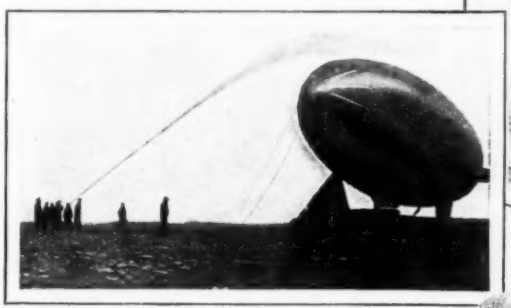
A portable mooring mast, carried in two nine-foot sections in an accompanying truck, held the blimp's nose fast when she rode her lone landing wheel on the ground. Her crew, comfortable in tents pitched directly beneath her nose, were always in readiness to lend a hand in an emergency.

Nearly 20,000 passengers have been carried aloft in this barnstorming bag. Yet none came nearer death than an unnamed passenger who found himself surrounded by three storms as the blimp tried to return to Teterboro Airport at Newark, N. J., at the outset of the long hop west.

"From the ground we could see the blimp trying vainly to circle the storm and after 15 minutes Lt. A. E. Miller, the pilot, ploughed through the worst of it and made a forced landing at Newark," Major Wadsworth recalls. "Lt. W. D. McCracken and I chartered a plane and rushed over there to assist Miller on the ground.

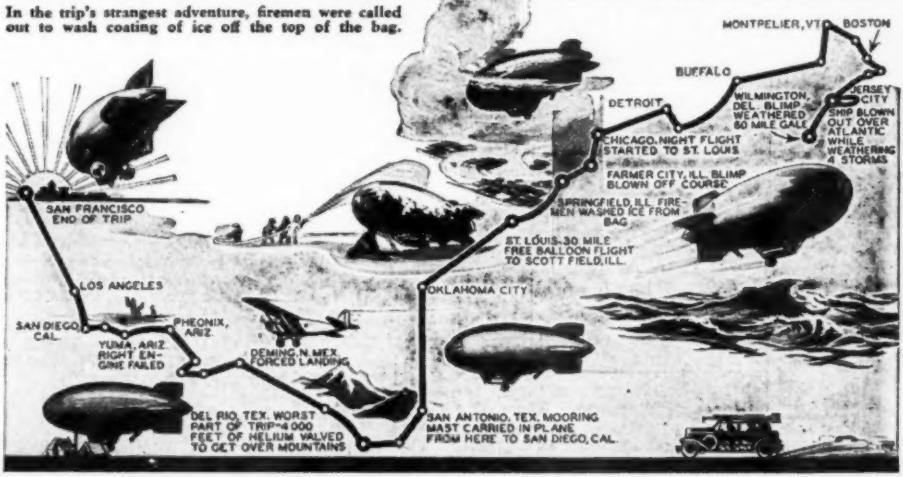
"All the passengers but one got out at Newark and he insisted on returning with us to Teterboro. We ascended in perfect weather but soon after leaving Newark found ourselves surrounded by three separate thunderstorms, one from the west, one from the north and one from the south.

"Darkness closed in so quickly we soon lost sight of the beacon. We could see the Long Island sound to the east and so we turned in that direction. After fighting the wind an hour and a half we found ourselves three miles out over the Atlantic with only enough gas for five minutes flying—plus one very excited and irritable passenger.



To prevent the ship's tail from gouging into the ground during a heavy blow at Newark, N. J., airport, four members of the ground crew had to hold up the giant rudder, as shown above.

In the trip's strangest adventure, firemen were called out to wash coating of ice off the top of the bag.


MONTPELIER, VT.
BOSTON
BUFFALO
DETROIT
WILMINGTON, DEL. BLIMP WEATHERED 60 MILE GALE
JERSEY CITY
SHIP BLOWN OUT OVER ATLANTIC WHILE WEATHERING 4 STORMS
CHICAGO. NIGHT FLIGHT STARTED TO ST. LOUIS
FARMER CITY, ILL. BLIMP BLOWN OFF COURSE
SPRINGFIELD, ILL. FIREMEN WASHED ICE FROM BAG
ST. LOUIS. 30 MILE FREE BALLOON FLIGHT TO SCOTT FIELD, ILL.
SAN FRANCISCO END OF TRIP
LOS ANGELES
OKLAHOMA CITY
SAN DIEGO, CAL.
PHOENIX, ARIZ.
YUMA, ARIZ. RIGHT ENGINE FAILED
DEMING, N. MEX. FORCED LANDING
DEL RIO, TEX. WORST PART OF TRIP. 4,000 FEET OF HELIUM VALVED TO GET OVER MOUNTAINS
SAN ANTONIO, TEX. MOORING MAST CARRIED IN PLANE FROM HERE TO SAN DIEGO, CAL.

All the mechanical ingenuity that the crew could muster were required to bring the blimp through the hazards of the trip depicted on the illustrated map above. Truck carried mooring mast as far as San Antonio, where it was loaded on plane.

Barnstorming Blimp Made 5,000 Landings, Carrying 20,000 Passengers

Bedding down the barnstorming blimp for the night. Above is shown one of the ground crew hooking sand bags to handrails around car to secure the bag against high winds.

After the strain of the long flight, the pont motor is here being put in shape by mechanic.

Thanks to this staunch air wheel, the vagabond blimp was enabled to make more than 5,000 landings, all safe. In photo one of the crew is adjusting shock cord mechanism.

"We decided to attempt a forced landing and came over the airport at North Beach. As we flew low over the hangar, Miller throttled the engines.

"'We need help!' I shouted. 'Get some men out to land us!'

"They sent out 15 men and we attempted to drop our 300-foot rope, but something went wrong and the line did not fall. Then Miller tried to set the blimp down in the midst of the men, hoping they would grab the other lines to hold it down. We had a single opportunity to get some men in the proper position when the thunderstorm hit us and a gale blowing nearly 50 miles an hour broke on us, pushing in front of it a tremendous amount of water.

Ship Weathers 60-Mile Gale

"The wind dragged the crew and the blimp during the next fifteen minutes 1,000 feet back and forth across the airport. Soon the worst of the storm passed and we held the bag there nearly three hours until the crew could reach us.

"As an indication that these bags are extremely rugged, we rode out one 60-mile-an-hour wind at Wilmington, Del., without extra help. Had we had 50 men to hold the line we would have been in no danger, but a dozen men can do little against such great forces. A great part of the strain came on the men and the mast."

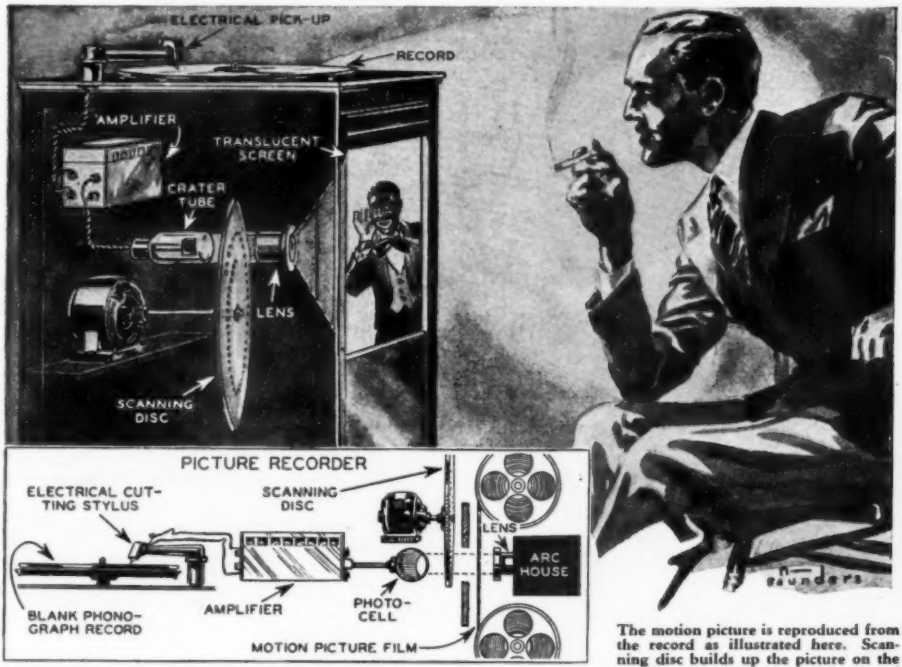
The thrills of barnstorming with a blimp seldom are witnessed by others than the crew. Two hours out of Chicago, after a midnight take-off for St. Louis, the blimp ran into very heavy rain and lowered ceiling. Maj. Wadsworth had sent an advance crew to Springfield, Ill., for help in case he should land there to refuel. In the darkness he was unable to find them.

"Rather than risk running into high buildings we went above the clouds and stayed there overnight," Major Wadsworth recalls. "We rode usually at 3,000 feet and made no effort to come down until six-thirty a. m. Even then we could not get through the fog.

"Every hour after that until ten-thirty we tried to make a contact. In one town we missed a chimney and a water tower by feet. The earth was hidden from us from two until ten-thirty. During that time we drifted approximately 150 miles. On one occasion we found ourselves over Farmer City, Illinois. Meantime, we had been flying a compass course which should have land-

(Continued on page 177)

Home Movies From Phonograph Records



In recording the motion picture film, a photo electric cell registers the pictures through the scanning disc, actuating specially designed electrical cutting stylus.

The motion picture is reproduced from the record as illustrated here. Scanning disc builds up the picture on the translucent screen, where it is viewed by the spectator. 100 feet of film may be played on a 10-inch record.

PLAY a moving picture from a phonograph record!

When Baird, the English television experimenter, suggested this system several years ago, he did not realize how soon it would be before his prophecy would come true.

Those who have listened to television programs know that the signals become audible in the form of a shrill whistle in the loudspeaker. This whistle carries the picture elements in the form of modulated sound.

If we pass this sound through suitable apparatus it becomes capable of reproducing a picture. It is obvious, then, that we could record this sound on a phonograph record and "can" a picture just as we now "can" sound in the form of music.

The sound, in the form of electric current, is taken from the phonograph record by means of a specially designed electrical pick-up. From this point it is carried to an amplifier and thence to a television crater tube. At this point the image is thrown on the screen.

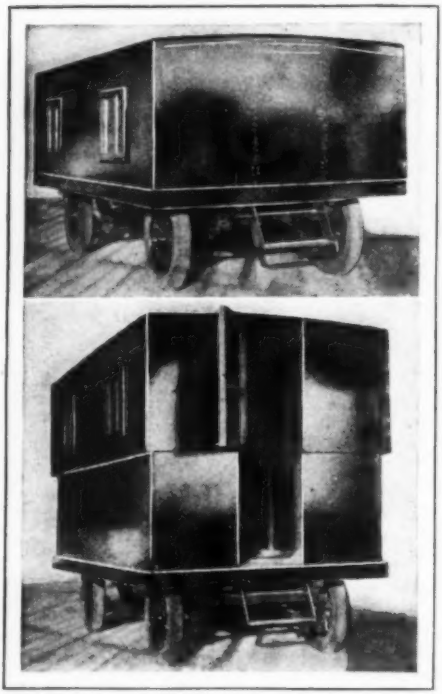
While much remains to be done to develop this apparatus, we may look forward to the day when our moving pictures will come in this new and convenient form.

Auto Chair for Crippled Vets

AS a means for making life more comfortable for crippled war veterans, a German mechanic has designed an "auto chair" which conveys the ex-fighters from place to place with utmost convenience. The motorized chair, shown below, is driven by a motor of low horsepower, and is easily maneuverable in the closest places. Bicycle-size tires add comfort.

Crippled German war veterans are enabled to transport themselves in this special "auto chair," powered by motor.

Telescope Camp Trailer Allows Greater Traveling Speed



When traveling, the upper section of the trailer can be telescoped down over the lower section, as shown above, eliminating sway and allowing greater traveling speed.

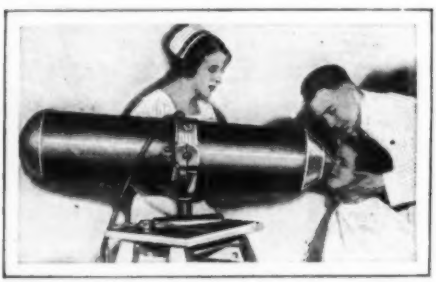
TOP-HEAVY camp trailers with all their inconveniences are sentenced to become a part of that great collection of "has beens" with the introduction of the new telescope-model trailer.

The body is made in two sections so that by turning a crank the upper half slides down over the lower section. This reduces the possibility of swaying and tipping, the bugbear of top-heavy models, and permits greater traveling speed. The accompanying photo shows both positions.

The trailer is unusually light, being made of composition board.

800-lb. Magnet Treats Eye Injury

AN EYE magnet so powerful that it will pull a flatiron across a room has recently been installed in a Minneapolis, Minn., hospital to remove steel cinders from patients' eyes. It is the largest eye magnet in the world and weighs over 800 pounds. One and one-half miles of copper wire are wound in the apparatus, which uses a 220-volt current.



This huge magnet contains 1½ miles of copper wire and is used to draw steel cinders out of the patient's eyes.

New Solder Will Repair Any Metal

COOKING utensils, water pipes, radio connections, engine blocks, in fact, anything made out of any kind of metal, can all be repaired with a new solder called "Alumaweld."

The substance requires no preliminary heating and may be applied with a soldering iron or blow torch. When the solder is used, a chemical reaction causes the metal surface to break down, allowing solder and metal to fuse.

Applied with ordinary iron, this new solder fuses with surface of any kind of metal.

How Did Apple Get Into Bottle?

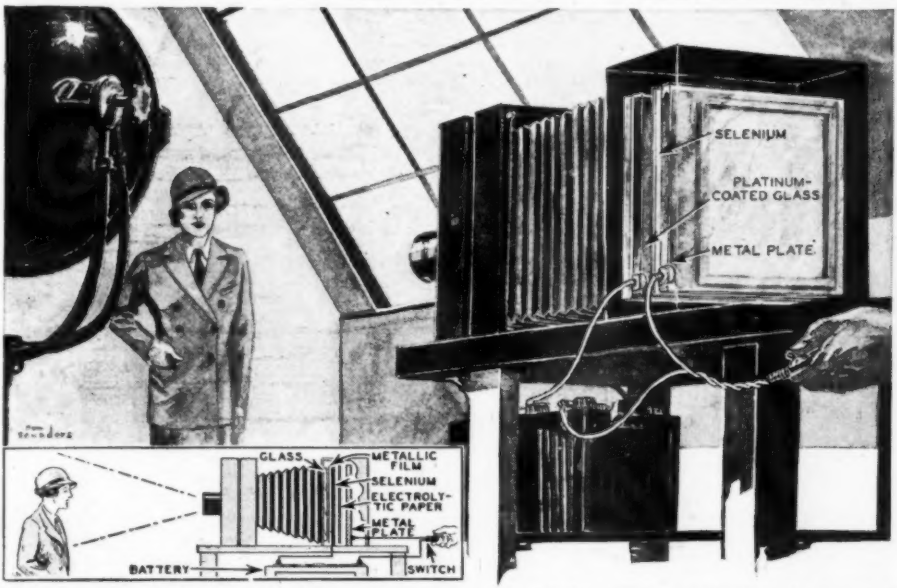
THE photo of the apple in the small-necked bottle in the accompanying photo is a familiar sight to everyone who has visited produce exhibits; yet very few people know just how the trick is accomplished. Here is the secret.

When the apple tree is still in blossom a branch showing developing fruit is pushed into a bottle containing a quantity of moist soil. The bottle is then fastened to the branch.

When the apple is grown to the desired size, the branch is broken off and the soil removed from the bottle. Try it yourself this summer.

Fruit is grown right in bottle.

Electric CAMERA Works Without Film

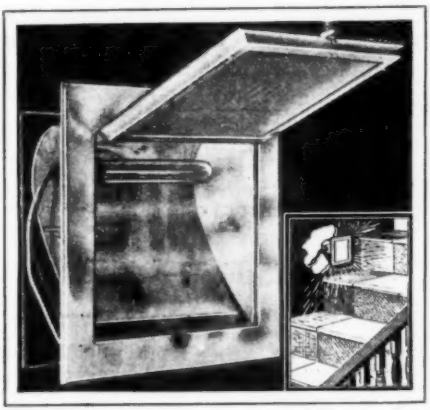


When the electric switch is snapped, the image impressed upon the selenium will be reproduced by the process of electrolysis on the paper, which has been soaked in a special electrolyte. The rear metal plate forms second electrode.

SELENIUM, that wonderful metal that changes its electrical resistance upon exposure to light, has recently been used in a most revolutionary camera developed by Mr. K. Wilcke, German scientist. In the ordinary sense of the term, this experimenter uses no film, and entirely dispenses with the use of silver compounds.

In a special camera, shown above, the light enters through a standard lens and strikes a glass plate, on which is a very fine film of metal-like platinum or gold; so fine that it will permit the passage of light. Backed up to this metal film is a layer of selenium, behind which is placed a piece of paper soaked in a special electrolyte. The last member of the group is another metal plate, which serves as second electrode.

Due to the process of electrolysis, the image impressed upon the selenium will be reproduced upon the paper, the most metal being deposited in the dark portions of the picture.



Light from a bulb is reflected through glass onto steps.

Fixture Lights Up Halls, Stairs

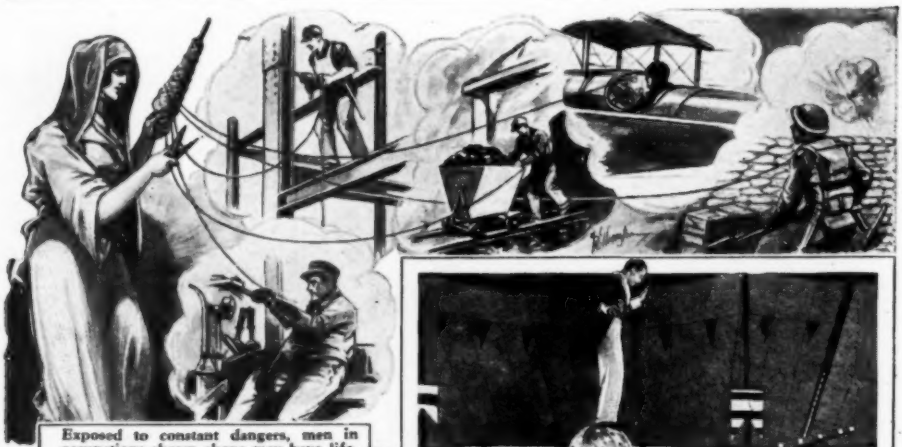
IMPROPERLY lighted stairways and floor surfaces often detract from the beauty of your home, and in many cases are directly responsible for turned ankles, tripping on steps, and falls.

If the overhead lighting in your home doesn't throw sufficient light, this condition can be remedied by the installation in the baseboard of a miniature flood-light now being marketed.

The diagram on the left shows how the light is reflected through a glass by the curved metal strip behind the light bulb. The best lighting results from using a bulb of the elongated type such as is used for showcase and desk lighting because of the longer light element to be reflected. Ordinarily, a 25-watt bulb will be large enough.

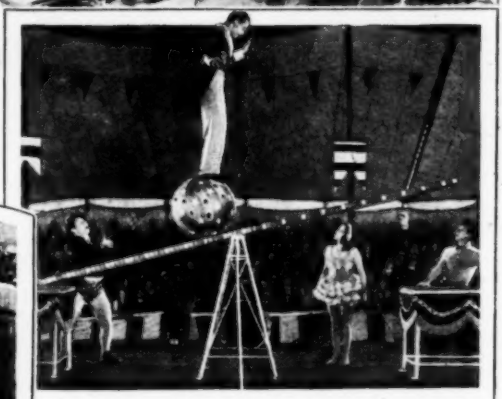
When set flush in the wall, the light fixture is inconspicuous.

Science Calculates HOW



Exposed to constant dangers, men in occupations shown above may have life-thread cut prematurely.

Motorcycle racers in the circus "whirl of death" are rated "N.I.R." (Non-Insurable Risk) by insurance actuaries. The occupation is classed as too hazardous—that is, the rider stands too great a chance of being killed before a policy is paid up.



Practically every job around the circus is rated as hazardous by insurance companies. Calculations show that deaths occur five to fifteen years ahead of average age for expiration.

by JAY EARLE MILLER

How long will I live? That's a question of vital interest to everybody. Fate withholds that knowledge from you, but scientific calculations, taking account of your job, show about what your life span will be. Read this article to learn your chances for living to a ripe old age, and some of the strange accidents that lie in wait for you from one day to another.

IS YOUR lot in life too dull and hum-drum? Do you crave danger and excitement? And if you do, do you know how to find it?

Here's a new way to find thrills for those who find life too quiet. Call on your insurance agent and ask to see his list of N.I.R.'s, which is short for "non-insurable risks." Then pick out your new job.

There's steeple chase riding, for example, if you are fond of horses. Get into that game and no insurance company will want to write a policy on your life. Or if horses seem too tame you can take up wild animal training, another job which no insurance company wants to insure.

If you don't need to make a living while seeking danger you can take up exploring. Some people have doubted that exploration, in these effete days of radio communication, airplanes, and ready rescuers is a dangerous life, but the insurance companies continue to class trips into the unknown as an extra-hazardous occupation.

Not everybody can afford to go out hunting up new spots on earth, and for them there is a long line of money making activities which are just as dangerous as exploring. Try deep sea diving, for example. It is classed as N.I.R. Or if you don't like

LONG You Will LIVE

Clyde Beatty, circus lion tamer, can't be insured because of extreme danger he faces.

Extremely thrilling and lucrative is occupation of deep sea diving, but if you're a diver insurance statistics show you're not likely to live to ripe old age, so you're classed "N.R.I."

Because of the fact that many firemen go to early death when battling flames, "smoke eaters" are advanced in age four years by insurance companies. That is, firemen are likely to die four years earlier than the average citizen.

water there is caisson work and tunnel and subway construction, in which the workers labor under compressed air.

Caisson or tunnel worker's disease, which is the same as the "bends" of the deep sea diver, is due to the effects of alternate compression and decompression, which are apt to release free nitrogen bubbles into the blood stream.

If you live in a big city and want to be paid while getting your thrills you can take up window washing as a vocation, or if you prefer the life of the quiet open spaces get a job as a turpentine still tender in the southern pine woods. Both jobs are non-insurable.

Take Your Choice of Dangerous Jobs

In hunting for dangerous jobs you can get, according to the figures of insurance actuaries, just about any degree of danger you want.

When you take out an insurance policy, of course, you are betting the insurance company that you will get sick, have an accident or die before the bet expires. Of course, if you lose the bet and the company keeps your money you are presumably just as well pleased, perhaps more so, than if you had won.

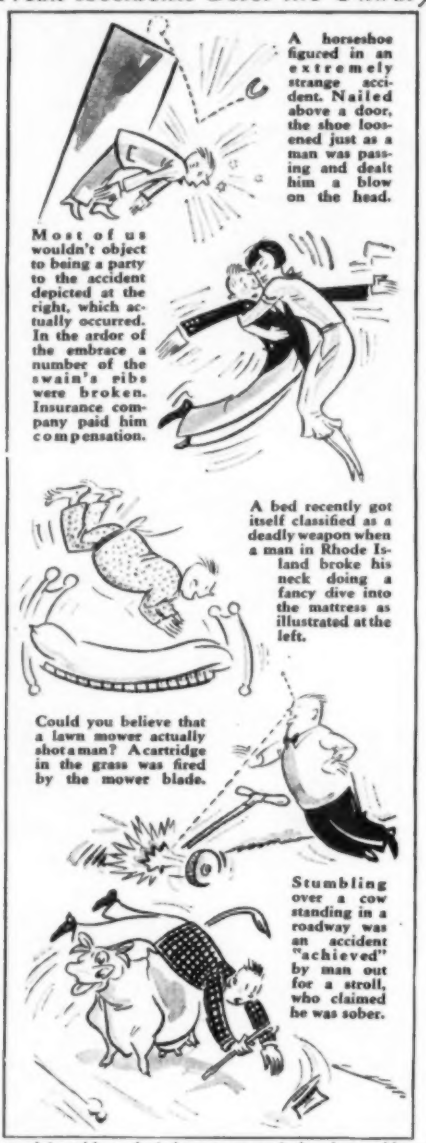
In grading the odds on which the bet is laid, the insurance actuaries of one company figures a fulminate mixer in a cartridge factory or a nitroglycerin maker should pay premiums equal to those of people 25 years older than his actual age.

For example, if you get such a job at the age of 25 your insurance company will demand a premium rate equal to that of a 50 year old man. On the other hand workers around powder factories are advanced in age rating from six to ten years by the same company, the ten year advance being for actual powder mixers.

Babe Ruth Made 4 Years Older

If Babe Ruth carries his insurance in this particular company he is advanced in age rating four years and is allowed no disability insurance The same company advances marshals, sheriffs and deputies five years, and insures policemen at the same advance, while it gives policemen disability insurance—which is refused to professional baseball players—at a price equal to double the usual rate.

Freak Accidents Beset the Unwary


A horseshoe figured in an extremely strange accident. Nailed above a door, the shoe loosened just as a man was passing and dealt him a blow on the head.
Most of us wouldn't object to being a party to the accident depicted at the right, which actually occurred. In the ardor of the embrace a number of the swain's ribs were broken. Insurance company paid him compensation.
A bed recently got itself classified as a deadly weapon when a man in Rhode Island broke his neck doing a fancy dive into the mattress as illustrated at the left.
Could you believe that a lawn mower actually shot a man? A cartridge in the grass was fired by the mower blade.
Stumbling over a cow standing in a roadway was an accident "achieved" by man out for a stroll, who claimed he was sober.

Potential accidents lurk in unsuspected situations. Above drawings illustrate some of the strangest on record.

The list of dangerous but not extra-hazardous occupations is a long one. You can be a professional bicycle racer in the six day races, for example, and get your insurance at the same price paid by a man twelve years older than yourself.

If you want a comparative idea of just how dangerous six day bicycle racing is, note that soldiers in the U. S. Army can be insured by the same company on the same terms, or that workers in acid factories making muriatic, sulphuric and nitric acids, are advanced but 15 years in age rating.

Bike Race Exceeds Trapeze Act in Danger

In fact riding in a bicycle race is considered more dangerous than being a circus performer on the catching end of an aerial act operating with a safety net. The catcher on the trapeze is rated up seven years, while the leaper is rated up ten years, two years less than the bicycle rider.

If you have ever thrilled to a perch act, one of those affairs where a sturdy fellow with a wide leather belt holds a lofty pole while a brother performer goes through his antics at its top, have you considered the relative hazards of the two occupations?

The insurance actuaries have it down to a fine point. Just charge the top man a premium 15 years in advance of his actual age, limit him to 10 or 15 years endowment policies, and mark the understander, who holds the pole, up five years.

In other words the chances are three times as great that the top man will fall and be hurt or killed as that he will fall on the understander and hurt him.

And if you want to find a mildly dangerous job right at home get one as a billposter. The insurance man will rate your premiums as though you were five years older than your actual age.

Bath Tub Rates as Deadly Weapon

How people get hurt is a subject of constant study by the actuaries. The bathtub has often been cited as one of the most dangerous things in the home, because so many people slip and are injured, or even killed in it, while others faint and get drowned, or touch some electric appliance while in the water and get shocked to death.

The bath tub dangers may seem amusing until you study the figures. An analysis of 5,581 violent deaths in New York in one year showed 95 people killed while bathing and 95 hit and killed by falling objects. If you didn't know those figures you might think that the perils of walking through sky-scraper lined streets would be far greater than those incurred while taking the

A milk wagon driver was starting point for one of world's strangest accidents. While filling gas tank, cigarette ash fell on his coat, which he tore off and threw aside. It fell on a horse, which kicked it on a straw pile. Result—village set afire.

morning bath, but figures can't lie.

The same table shows another surprising thing. Which is the most dangerous, football or baseball? Most people would say football, but where one person was killed playing football in New York City during that year six were killed by baseball. Of course, the six may have included spectators hit by balls as well as players, but nevertheless the danger seems six times as great as in the supposedly far more dangerous game of football.

Freak Accidents Take Heavy Toll

Insurance figures each year reveal new and weird ways in which people may be hurt or killed. Consider the man whose ear was cut off by a derby hat, the one who was burned when he slipped and slid down an icy glacier, the child who broke her neck while eating an onion, or the chap who was shot in the head by a lawnmower, which set off a cartridge which he ran over while mowing the lawn.

A man in Rhode Island broke his neck diving head first into bed, which makes the bed rate in the class of the bathtub as a deadly weapon. A truck driver was bit on the arm by a pig he was taking to market, lost control of his truck and wrecked it in the ditch—a real road hog accident.

One of the rarest accidents listed in recent years was reported by an insurance company which paid compensation to a young man whose ribs were broken when he was hugged by his best girl.

His plight was as unusual as that of the young swain whose leg went to sleep while he was holding his girl on his lap. When he attempted to rise the leg buckled under him and his insurance company paid damages for his bruises.

Stroller Falls Over Cow—Cyclist Hits Elephant

A man who fell over a cow standing in the roadway collected damages, as did the family of a man who bumped his nose against a bed post, causing blood poisoning from which he died. In England a cyclist ran into an elephant on the road, and in the United States two cyclists ran into deer in one year.

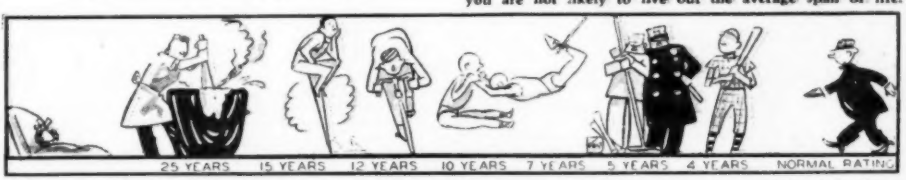
Probably the prize accident of recent years occurred in Evanston, Illinois, some time ago. A milk truck driver stopped at a filling station to fill his gas tank. He lit a cigarette and some of the hot ashes fell on his coat tail, which had been saturated with gasoline, and the coat burst into flames. The frightened driver hastily tore off the garment and hurled it away, without looking where. The coat lit on the tail of a horse, which switched his tail and tossed

(Continued on page 176)

Figures Show Occupation Life Span

Window washing may look like a prosaic job, but insurance actuaries think it so dangerous that they won't sell the workers an insurance policy.
The introduction of electric power has produced all sorts of new accidents, from workers shocked to death in power houses to linemen falling off poles. Statisticians have worked out probable life span.
Despite radio, airplanes and other such aids, exploration is still classed as an extra-hazardous occupation, and adventurers setting out into the unknown are classed as Non-insurable risks. Chances of return are not given 100% rating.
Strange as it seems, baseball is more dangerous than football. Where one person is killed in football game six are killed in baseball. Fatalities, however, were mainly among spectators on the sidelines.
Mining rates as one of the most hazardous of occupations, owing to dangers from gases in mine shafts and collapsing walls, to mention only a few of perils encountered. Job of actuary is to compare miners' average span of life with that of safe occupation.

If you engage in any of the occupations depicted above, you are not likely to live out the average span of life.



Fulminate mixers in powder factories, perch actors, bike racers, trapeze performers, bill posters, cops and baseball players are advanced in age as listed above, which means that they are likely to die 4 to 25 years earlier than average person.

Latest Mechanical Aids for

The new wall device shown above dispenses just the right amount of tooth paste or shaving cream and solves the problem of the missing tube caps. All colors are available.

This indispensable guard, now on the market, slips easily onto the back of any knife, protecting the fingers from cuts and facilitating cutting.

The time-saving apple slicer shown above simplifies the process of preparing the fruit for pies, sauces, and other edibles. A single push on the handles of the slicer removes the core and divides the apple into eight equal parts. The device consists of a heavy wire ring with handles, encircling a set of sheet metal blades, and works equally well with unpared fruit. The blades are easy to sharpen.

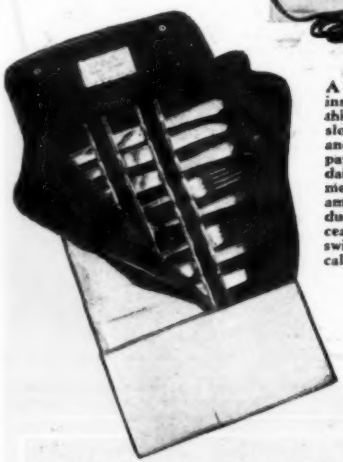
Here's a teapot which keeps the tea off the leaves. It tips backward while the tea is being made. When righted, the leaves are automatically removed from the brew.

Modern Mechanics and Inventions Editors Will Furnish You With

Convenience of Housewives

The rubber plunger on the end of a short, light-weight stick shown below constitutes hand operated "washing machine," especially adapted to washing hosiery and lingerie safely and easily without wetting hands.

A slot machine is the installment collector for this refrigerator. A coin slot receives quarters and half dollars, and payments may be made daily or in advance. A meter registers the amounts paid and still due. When payments cease, the current is switched off automatically till coin is inserted.



Fabric highly impregnated with silver particles prevents the tarnishing of the contents of this silverware roll. Instead of acting on the silverware, the tarnishing agents are absorbed by the metal in the material, leaving utensils unharmed.

These individual cocktail trays shaped like artist's palettes, are the newest thing for parties. They provide convenient and compact compartments for keeping cocktail, sandwiches, and ash tray within easy reach.

Addresses of Manufacturers of Household Aids Shown on These Pages

How to KEEP WELL

This camping scene looks pleasant, but outdoor fans who are really enjoying themselves are those who know how to beat off the attacks of the bugs, which strike from every point.

by WALTER E. BURTON

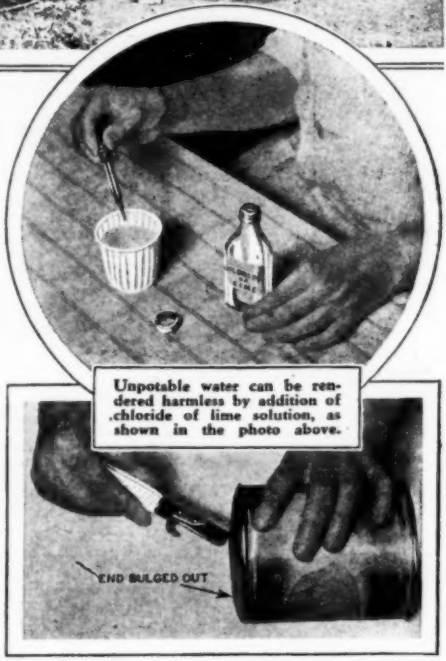
Your vacation can be miserable or pleasant, either way you wish. Just how pleasant it will be depends upon how effectively you can combat the hosts of insects and other nuisances which are trying to make you miserable. Read this timely article to learn the best methods for fighting such annoyances as chiggers, mosquitoes, deadly drinking water, etc.

THE standard joke that the average person returns from a vacation feeling worse than before can be turned into nonsense by the observation of a few simple health precautions.

By guarding yourself against bad food and drink, mosquitoes, chiggers, snakes, poison ivy, excessive sunburn and undue fatigue, you can realize a hundred per cent profit on your annual rest period.

Vacation today often is another word for automobile camping. The trip to the scene of so-called rest consumes from a few hours to several days. The wise motorist will avoid tummy-aches by insisting on regular stops for meals. He will start out with a good breakfast, will pause for a light lunch and will stop driving in time for a substantial supper.

Between meals he will not munch peanuts or chocolate bars; and he will profit by half-hour rest periods after each meal.



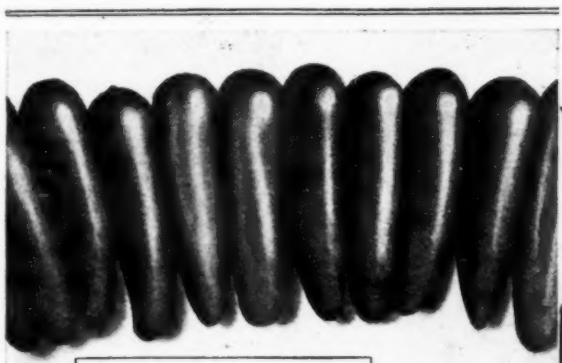
Unpotable water can be rendered harmless by addition of chloride of lime solution, as shown in the photo above.

Contents of can which has end bulged out, as shown above, are deadly, so take pains to avoid their purchase when you're on vacation. Edibles have decayed, forming gas that expands.

If on your auto trek you are forced to use water of questionable purity, treat it as follows, before drinking it:

Prepare a germ-killing solution by dissolving one-half teaspoonful of chloride of lime in a pint of water. This is a stock solution. To a quart of water you intend to drink or use in cooking, add 10 drops of

Though Vacationing



Microscope view of mosquito eggs which can be destroyed by pouring oil over surface of breeding ponds.

If mosquitoes infest your tent, spray it with oil of citronella, as shown above, particularly in the corners.

Three most potent weapons against the mosquito are oil of citronella, eucalyptus, and peppermint. When rubbed on exposed parts of flesh, these liquids will repel the pests.

Scientists have discovered that mosquitoes hate white and yellow, so the pests will leave you alone if you wear white clothes and yellow socks, along with mosquito net hat.

this stock solution, or a teaspoonful to a gallon, and let stand for 15 minutes.

There will not be enough of the chemical to hurt you, or even make the water distasteful, but it will kill all harmful organisms in the water and perhaps prevent your contracting typhoid fever or other ills.

Many vacationists will swear that common house flies bite them. The truth is that the common fly cannot bite, but does its dirty work by transporting disease germs on its feet. A handkerchief draped around the neck or held under the hat so that it falls down over the neck is found to be the best protection against the pestiferous fly.

You will have to select the middle of a good-sized ocean or desert if you would avoid mosquitoes entirely. It is wise to swat the fly, but not the mosquito. When you smash a mosquito on your skin, you may break off its proboscis, or sucking mouth, leaving it sticking in your skin to cause irritation.

Combating the Pestiferous Mosquito

If oil of citronella or any other anti-mosquito lotion, such as eucalyptus or peppermint, will not keep these energetic insects away, get out your trusty spray gun and saturate the vicinity thoroughly. Pay particular attention to dark corners of your tent or cabin. At night, use netting over your bed or the openings of your tent to keep insect pests out.

Scientists have noted that Madame Mosquito has an artistic sense and is affected by colors. Hungry and looking for something to eat the mosquito nevertheless dislikes most those who are dressed in yellow and white. Since the flying plague more

Here Are Most Effective Remedies for Caterpillar, Bee or Wasp Stings

When a bee succeeds in an attack on you, carefully remove the stinger and wash the wound with strong soap or ammonia. For caterpillar's wounds, apply sodium bicarbonate and ichthyol ointment.

The question of whether or not the tarantula, shown above, is fatally poisonous, is disputed, but you'll be wise to take pains to avoid it. If you get bitten, make for a doctor's office.

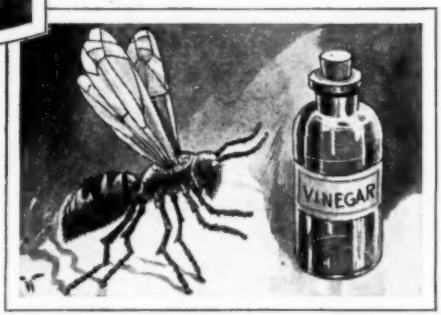
frequently attacks the ankle, the wearing of bright yellow or white hose will bring about a certain immunity in the lower areas of the anatomy. A mosquito net hat will take care of the upper parts.

The spider family may cause you much apprehension and a little trouble. Contrary to popular belief, nearly all true spiders are incapable of harming humans because they cannot bite through the skin. There is only one really poisonous spider—the Black Widow which is sometimes encountered in southern climates. It can make a strong man ill, simply by biting him.

Sulphur Best Defense Against Chiggers

There is a tiny member of the spider family that you may encounter in many parts of the United States. It is the well-known and despised chigger. Hardly visible to the naked eye, these creatures bury themselves in the skin and proceed to raise a painful commotion. They do their burrowing by secreting a fluid that dissolves the skin away to form a hole, and it is this substance that causes the extreme itching and irritation.

If you suspect that you will encounter chiggers during a hike or other venture into the bush, sprinkle your skin liberally with powdered sulphur, or take a bath in a strong solution of photographer's hypo and let it dry on the skin. This hypo bath deposits a fine layer of sulphur which chiggers find repulsive.



An application of vinegar proves the best remedy for a wasp sting. However, before treatment make sure whether the sting was from wasp or bee and then treat accordingly.

Health authorities recommend strong salt baths immediately after returning from chigger territory. Wherever you find that the pests have dug into your skin, press them out with tweezers or a knife blade. Then apply some antiseptic such as iodine to prevent infection.

Chiggers, in staging an attack on a camper, usually begin their offensive at the bottom, reaching the feet first, then climbing rapidly up the body. Anything constrictive about the body, however, discourages the chigger from investigating higher. Leather puttees will go a long way towards

Photographer's Hypo Solution Protects You Against Attack of Chigger

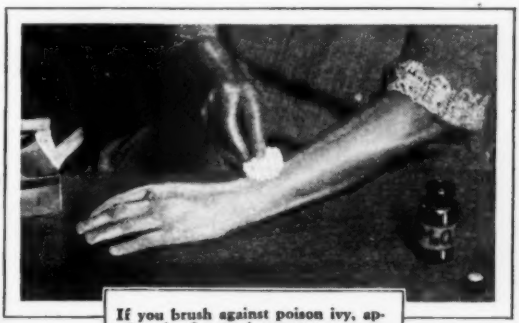
Hypo, applied to the foot, repels chigger attacks.

Chiggers and ticks attack campers first at feet, then crawl up. Best defense against these pests are puttees or other constrictive articles, such as garters, belts and arm bands.

beating off the initial attack, and garters will stop the first onrush, while the belt and armbands will act as second-line trenches.

It may be that ticks instead of chiggers are the favorite pest at your vacation spot. This pest, like the chigger, climbs up your body from the ground and hence may be warded off with leggings, like chiggers. They attach themselves firmly to the skin and draw blood.

A good greasing with vaseline, salty butter, or even kerosene, will make them easy to remove with tweezers. The bite then should be disinfected by dipping a sharp round toothpick with a small wad of cotton in tincture of iodine, and working the antiseptic into the hole.



If you brush against poison ivy, apply sol. of potassium permanganate.

After you have gouged a tick or chigger out of the hole he has dug in your skin, apply iodine to wound as shown.

Bees and wasps have a most annoying habit of attacking campers, and apparently without just provocation. It is a brave vacationist who will pick a fight with these creatures.

Naturally, say the scientific gentlemen, avoid the bee, but if you do get stung then it is well to know how to act. If it is a bee, then the procedure is different than if it is a wasp. Each should be treated with different remedies.

The bee sting is acid and should have some weak alkaline preparation like wet soap or ammonia. The wasp's sting, however, is alkaline and should be treated with applications of vinegar.

How to Remove Bee Stinger

There is a certain technique to be followed in the removing of a stinger left by the bee or wasp. It is not wise to follow the natural instincts and pull the stinger out with the fingers, for then the poison in the sacs is forced down into the blood. The better way is to lift the sting out carefully with the blade of a knife so that the sacs are left intact.

One of the most annoying creatures of the woods and fields is the caterpillar. They

(Continued on page 175)

Pedal-Driven Prop Speeds Bike Along at 15 M.P.H. Clip

Bicycle is driven forward at 15 m.p.h. speed by the propeller, which revolves when pedals are operated by rider.

EUROPE'S bicycle riders seem to be getting speed-minded as well as air-minded. From England comes the bicycle shown on the left which is driven by a propeller. The inventor has attained a speed of 15 miles an hour with his novel bicycle.

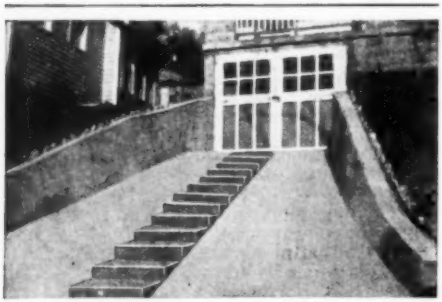
The prop is supported on the back of the bike by two rods from the lower cross-bar of the frame and one from under the seat.

The sprocket has been removed and the chain adjusted to the cog on the end of the propeller shaft which runs through the upper brace rod. Operating the pedals turns chain on cog, setting the propeller in motion.

Machine Will Harvest Potatoes

AGRICULTURAL engineers at Pennsylvania State College have developed a mechanical device to take the backache out of harvesting potatoes. The machine is attached behind the ordinary potato digger which drops the spuds into a slowly moving conveyor. This carries them to a table from which the pickers sort the spuds.

Steps Built Into Cement Driveway



A narrow strip of low steps is built in the cement driveway to facilitate walking when drive is coated with ice.

HERE is the latest wrinkle in cement driveways. A Cincinnati car owner whose garage is located on a steep hillside disliked the task of walking up and down the drive so he installed the steps, as shown in the photo.

The steps are set in low enough so that the car chassis does not touch them when driving in or out of the garage.

Novelty Bank Registers Any Coin

EVERY penny, nickel, dime, quarter and half-dollar dropped into the bank shown in accompanying photo is automatically registered on the dial. Built with a clock-like face, the large hand indicates the number of dollars and the small hand the amount of cents in the bank at any time.

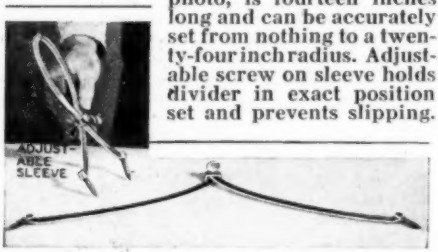
The bank is of strong construction and intended either for a child's saving bank or budgeted saving system. When $10 have been deposited, bank opens.

Hands on face register coins as deposited, show total in bank.

Quick Set Dividers Have 24″ Span

CARPENTERS, mechanics and others who work with adjustable tools will appreciate the new quick set dividers because they may be rapidly adjusted and will not slip or spring.

The device consists of two crossed legs of nickel plated steel riveted together and with a sliding sleeve at the point of intersection. The tempered steel points are threaded and may be removed or replaced as needed. The large size, shown in the photo, is fourteen inches long and can be accurately set from nothing to a twenty-four inch radius. Adjustable screw on sleeve holds divider in exact position set and prevents slipping.

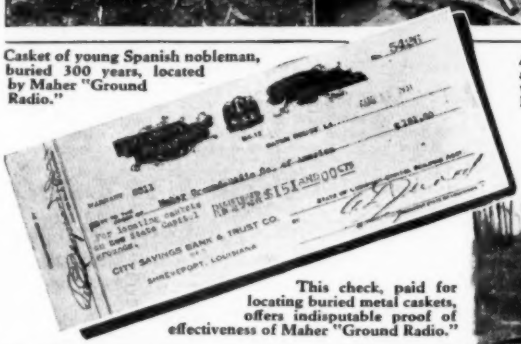


An adjustable sleeve locks the divider at the radius you want and will not slip. The device has a 24-inch span.

"Ground Radio" Locates Buried Treasure

Casket of young Spanish nobleman, buried 300 years, located by Maher "Ground Radio."

Above are shown few of the treasures, including ancient firearms, silver and gold coins and pewter ware, located on site of Spanish military post in Louisiana. "Ground Radio" is seen in back of pit.



This check, paid for locating buried metal caskets, offers indisputable proof of effectiveness of Maher "Ground Radio."

George Maher, inventor of treasure locator, is here seen with one of his finds, a copper casket of child. Exploring coils are moved over ground, sounds in phones indicating presence of metals. Vacuum tubes act as detectors.

BURIED treasure hidden away hundreds of years ago and lying untouched ever since will be compelled to give up its secret when a new metal locating machine recently developed goes to work in the vicinity.

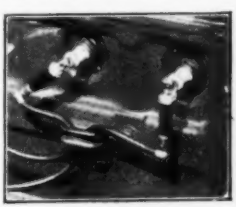
That the "Ground Radio Machine," as the inventor, George Maher, of Baton Rouge, La., calls his device, will fulfill all demands made upon it has been conclusively proved by severe tests. In one case the machine, exploring the territory which was once the site of an old Spanish military post, disclosed the location of a copper casket containing the body of a young Spaniard.

For his work in locating this casket, along with innumerable other treasures, including ancient firearms and numerous pieces of brass, silver and pewterware, many buried for over 300 years, the State of Louisiana accorded Mr. Maher recognition, proof of which is given in the check above.

Mr. Maher, who can be reached at Box 87, Baton Rouge, La., is keeping the construction of his treasure locator a closely guarded secret. Essentially, however, the machine consists of two exploring coils connected with a vacuum tube tuner which causes sounds of variable pitch to ring in the headphones when the coils are brought in the vicinity of buried metal. The nature of the metals is indicated by the pitch.

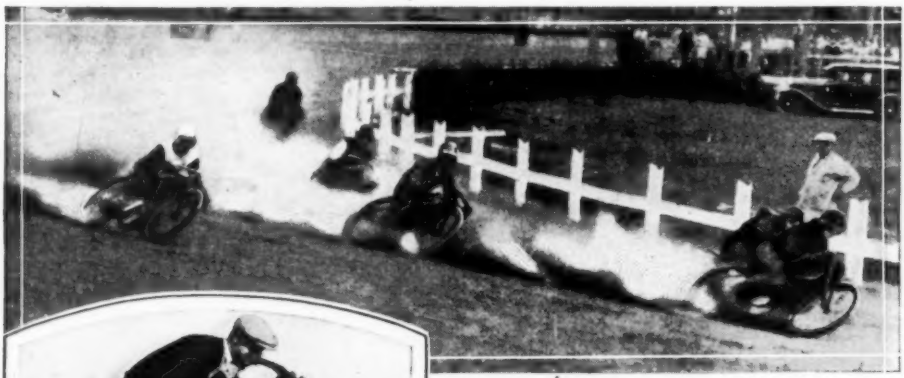
Eliminate Noises in Auto Radio

MOTORISTS who have suffered patiently under the nuisance of the inductive noises which issue from their auto radio along with the music will be grateful to the inventor of a new noise eliminator now being marketed. As shown in the accompanying photo, the device hooks onto the spark plugs, the source of the racket, to quench the inductive effect at its source. Once the eliminators are set in position, you can forget them.



Attached to spark plugs, as shown, eliminator does away with all noises in auto radio.

SECRETS of WINNING



A thrilling scene of a dirt track race before a crowd of 10,000 people at the New York State Fair. Riders have just broadsided their machines around the turn and are entering the straightaway at high speed. Note sprays of dirt.

Here is the correct position for motorbike racing. Note that the rider crouches low over the gas tank to minimize wind resistance.

When hitting off a stiff clip the rider is enabled to get firm seating by means of "knee iron" fitted to frame in position shown. Ball of foot fits over spool type rest, as illustrated.

by THEODORE A. HODGDON

With short track racing growing in popularity, you'll be wise to put your motorbike in shape to win cash prizes and trophies in events on your local oval. Here an authority tells how to equip your machine and explains the fine points of "broadsiding" on the turns—a stunt that proves more thrilling than flying.

MOTORCYCLE racing on dirt and grass tracks is becoming more and more popular each year, not only in the United States, but all over the world. Here in America last year there were many hundreds of racing events held by motorcycle clubs and mechanically-minded sport enthusiasts.

At the opening of the motorcycling season in London last spring the first cinder track meet was attended by more than 20,000 people who packed the grandstands to see an afternoon of thrilling racing events between the English team and the Australian team.

And in our own country early last year several great European nations were represented in the cinder track races held in the famous Yankee Stadium in New York City. Expert riders with their specially prepared dirt track racing motorbikes actually crossed the Atlantic from several European countries to compete in these contests of skill and speed before thousands of enthusiastic New Yorkers.

Cash Prizes Run as High as $2,500

Amateur motorcycle racers this year may also win fame and beautiful trophies, as well as merchandise prizes, for victories in amateur competition. And, those amateurs who are skillful enough to turn professional will make themselves eligible for winning considerable returns in cash prizes.

At the close of last season there was a National Championship Race Meet at Syracuse, New York, with seven events on the program and a total of $2,500 in cash money was put up for the winners! At other race meets throughout the country during the summer months, prize money runs from $150 to $250 at the small race meets, up to

MOTORBIKE Races

$1,000 at the more important race meets where there are national championship events.

Of course, in addition, there are many smaller meets run by clubs and private groups of individuals on short grass tracks, or their own dirt tracks, where riders win small cash prizes and trophies. It is a sport which is rapidly on the increase.

Short Track Racing More Thrilling

One of the biggest factors in increasing the popularity of dirt track racing has been the introduction of the so-called "Short Track Racing" where the track is laid out inside a stadium or small park, so that the riders travel six or seven laps to the mile.

As MODERN MECHANICS AND INVENTIONS devotees of automobile dirt track racing must know, the average Fair Grounds dirt track is usually a mile or one-half mile track, making one or two laps to the mile. Because of the size and speed of racing cars, these large tracks are needed for fast automobiles.

Motorbike Races Have Thrills of Flying

However, it has been found that fast powerful motorcycles, with low saddle position and proper handling, will offer more sport for both rider and spectator when ridden on shorter tracks, where there are anywhere from five to seven laps to the mile, so that a rider must needs broadside his bike nearly all through the race.

Races on these short tracks, usually with a track bed of cinders or sometimes grass or turf, are spectacular in the extreme, and a source of great joy to the man who likes to build things that go—and who likes to manipulate them after he gets them built.

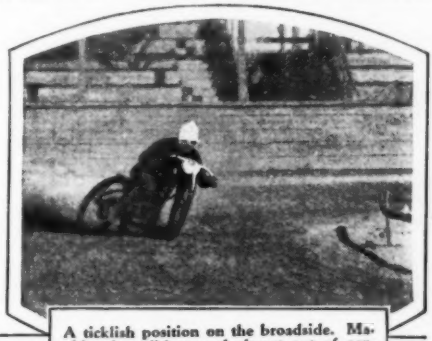
Just as the pilot of an airplane must fly his ship into a bank and out again—or into a carefully calculated side slip and straighten out again—so must the expert motorcycle racer control his bike in the curves and on the straightaways by very delicate, but correct, manipulation of the controls.

The writer of this article is a licensed airplane pilot with ten years of flying behind him—and outside of his first solo flight in a shaky crate years ago, he has never experienced a greater thrill than actually broadsiding a powerful motorbike around a short track.

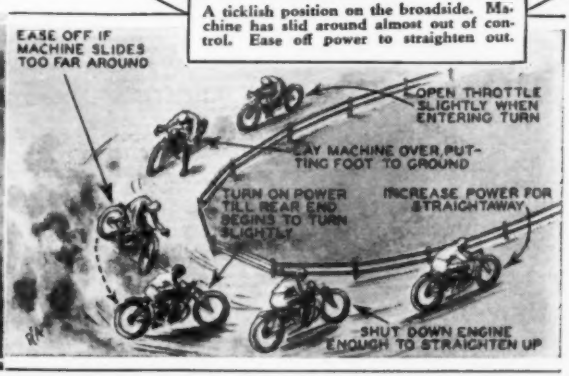
Ideal Sport for Mechanically Minded

Once the reader has sampled the joys of controlling a properly equipped motorcycle around the turns as on the straightaways of a short track—he will experience a red-blooded thrill that comes to the mechanically-minded man who likes speed, and likes to control powerful forces at a twist of his wrist or a touch of a button.

Every sport has a trifling bit of risk accompanying it. As to motorbike racing, it is advisable that amateurs stick to short tracks, since it is a physical and mechanical impossibility for an average motorcycle rider to obtain a speed in excess of about



A ticklish position on the broadside. Machine has slid around almost out of control. Ease off power to straighten out.


EASE OFF IF MACHINE SLIDES TOO FAR AROUND
OPEN THROTTLE SLIGHTLY WHEN ENTERING TURN
LAY MACHINE OVER PUTTING FOOT TO GROUND
TURN ON POWER TILL REAR END BEGINS TO TURN SLIGHTLY
INCREASE POWER FOR STRAIGHTAWAY
SHUT DOWN ENGINE ENOUGH TO STRAIGHTEN UP

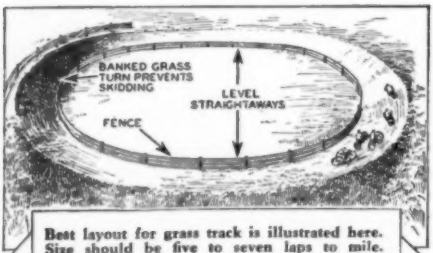
Left—A tense moment in a broadside. Rear end is sliding around rapidly, while rider is "dabbing" at the ground with foot to keep from spilling. Progressive steps in broadsiding around turn are illustrated in drawing at the right.

Strip Machine of All Unnecessary Parts—Stud Tires to "Bite" Ground

40 miles per hour around a short track which runs five or seven laps to the mile. The result—scarcely any danger, yet all the thrills of spectacular broadsiding.

Riders and clubs are nowadays constructing their own dirt track racing motorbikes—then trying and practicing with the special "broadside bikes" on short tracks laid out in smooth level field or ball park.

Every auto racing fan has seen the streams of dirt which shoot up into the air at the rear wheels of fast racing cars as they turn at high speed. These "sprays" of dirt are thrown up as the rear wheels of the car skid sideways at the same time they are spinning under the power from the motor.



Best layout for grass track is illustrated here. Size should be five to seven laps to mile.

Typical grass track race as staged by motorbike fans. Ovals can be located in any ball or amusement park, or even open fields.

It is not generally realized but these skids, or "broadsides," are deliberately planned by the driver to enable him to get around the turn and into the next straightaway section of the track with the least possible loss of forward motion.

The same thing applies to broadsiding a motorcycle. As the rider enters the turn, he opens up the throttle slightly, then "lays his machine over," guiding it around the turns and occasionally using his foot on the inside of the turn, as shown in an accompanying illustration.

Correct Technique of "Broadsiding"

If the rear end slews or slides too far around the power must be "eased off" a trifle—but not shut down suddenly, or the machine will straighten up quickly and a spill may result.

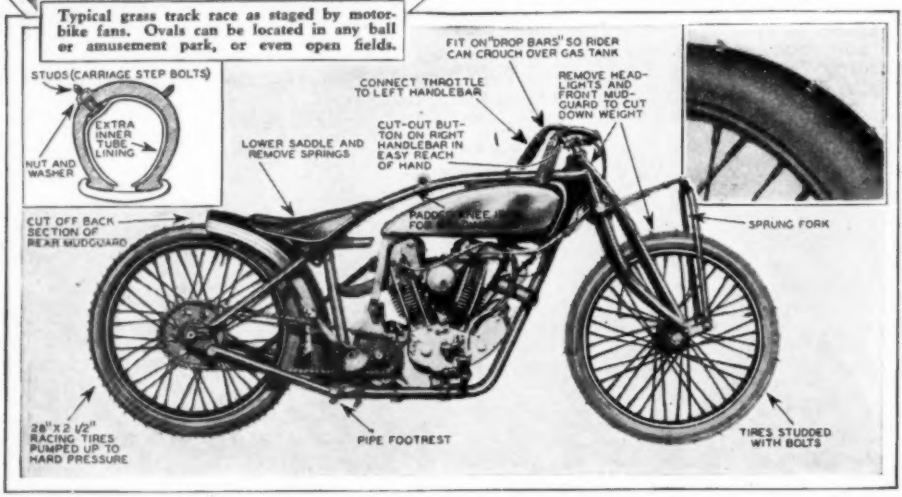
A basic rule for learning the art of dirt track racing was given to the writer by a famous racing star a few years ago, as follows:

"First, get your machine equipped right—with all excess weight removed, with drop bars fitted, and with small section tires fitted to the wheel.

"Then do your practising cautiously. Select a short track and go into the first turn at a fairly slow speed—then when you are halfway around this turn—turn on the power until the rear end begins to slide outward on the turn slightly. Keep the power on until you get into the straightaway, then shut down just enough to straighten up.

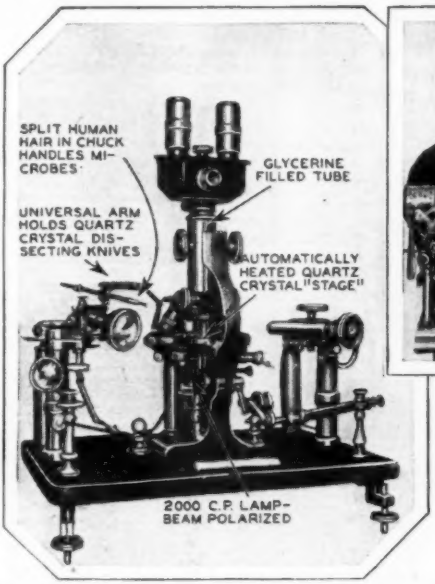
"Repeat this until you can control a broadside accurately, then increase your speed each time you hit the turn, so that you

(Continued on page 178)

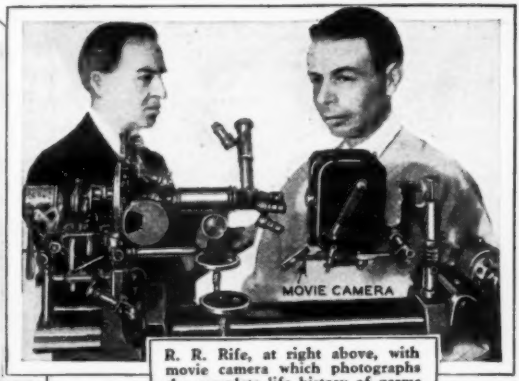

STUDS (CARRIAGE STEP BOLTS)
EXTRA INNER TUBE LINING
NUT AND WASHER
FIT ON "DROP BARS" SO RIDER CAN CROUCH OVER GAS TANK
CONNECT THROTTLE TO LEFT HANDLEBAR
REMOVE HEADLIGHTS AND FRONT MUDGUARD TO CUT DOWN WEIGHT
CUT-OUT BUTTON ON RIGHT HANDLEBAR IN EASY REACH OF HAND
LOWER SADDLE AND REMOVE SPRINGS
SPRUNG FORK
CUT OFF BACK SECTION OF REAR MUDGUARD
28" X 2 1/2" RACING TIRES PUMPED UP TO HARD PRESSURE
PIPE FOOTREST
TIRES STUDDED WITH BOLTS

Here's how to strip down and equip your stock motorbike for short track racing. All unnecessary parts should be removed, and drop bars fitted, with cut-out button on right handlebar. Regular foot rest is replaced by small spool type rest. To aid in broadsiding, racing tires (never balloon tires) are studded with bolts as shown in inset drawing and photo.

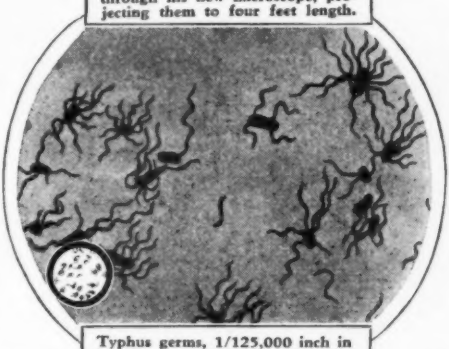
Microscope Magnifies 17,000 Diameters


SPLIT HUMAN HAIR IN CHUCK HANDLES MICROBES
GLYCERINE FILLED TUBE
UNIVERSAL ARM HOLDS QUARTZ CRYSTAL DISSECTING KNIVES
AUTOMATICALLY HEATED QUARTZ CRYSTAL "STAGE"
2000 C.P. LAMP-BEAM POLARIZED

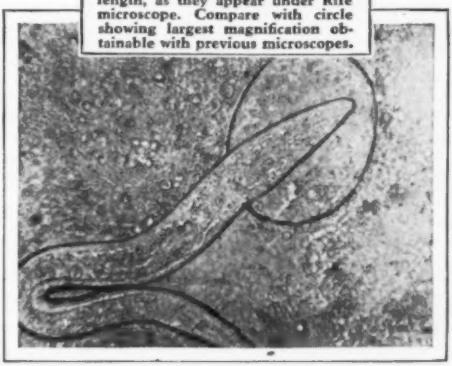
The Rife microscope, most powerful in the world, is encased in the perpendicular brass tube in center of photo. With the micro-manipulator, a split human hair enables a single bacterium to be picked up and even dissected!



R. R. Rife, at right above, with movie camera which photographs the complete life history of germs through his new microscope, projecting them to four feet length.



Typhus germs, 1/125,000 inch in length, as they appear under Rife microscope. Compare with circle showing largest magnification obtainable with previous microscopes.



Hatching of an intestinal parasite 1/100,000 inch long, shown emerging from egg tail first, enlarged from movie film made through Rife microscope for study of scientists.

IN A SMALL laboratory, over the garage where he worked for many years as a chauffeur, R. R. Rife, of San Diego, California, has built a microscope through which he, and other scientists, have seen phases of life never before beheld by man. With this microscope—which is of 17,000 diameters magnifying power, as compared with the 2,000 power of research microscopes previously built—he has seen bacteria develop in liquids which had been passed through the finest of filters, liquids in which other microscopes could find no bacteria.

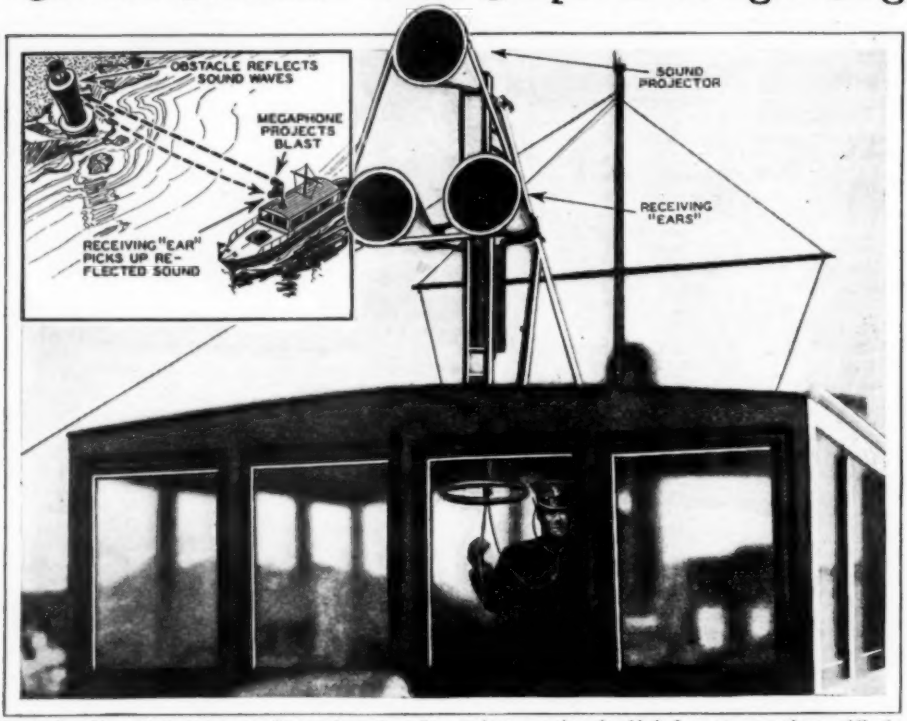
Bacteria 1/125,000 Inch Long Dissected

With this microscope he has measured, weighed, and even dissected bacteria only one-125,000th of an inch in length. With a greenish-gray ray, generated in an instrument of his own development, he has destroyed the germs of diseases, without injuring the tissues on which they lived. Using this newest and most powerful of microscopes, he has discovered that disease germs have color, each of its own kind; that even when their forms are similar, they may be distinguished by these colors, and he even hints at the possibility that the germs of all diseases are the same, at one stage in their existence.

On his way to this master microscope, Rife built several others, one of them of 12,000 diameters, another of 13,000 and one of 15,000. With even the smallest of these, he made motion pictures of living germs of disease, from the time they were cast off as spores by the parent organism, to the time when they themselves cast

(Continued on page 179)

"Sound Bullets" Pilot Ships Through Fog



Employing this sonic locator to get distance from shore line, navigators project air whistle from top megaphone, while the pair of receiving ears pick up echo. Distance is determined by interval between transmission of blast and reception of echo.

Drafting Machine Saves 40% Time

DRAFTSMEN will be greatly interested in a drafting machine, recently introduced, which eliminates completely the use of T-squares, triangles, scales and protractors. Shown in the photo below, the device attaches to the edge of the drafting board, and covers every section of the paper. The protractor is nickel silver, full circle, with accurate machine cut graduations, the vernier reading to five minutes. It saves 25 to 40% of drafting time.

New drafting machine eliminates use of T-square, triangles, protractors, etc.

"BULLETS of sound," which bound back to the ship from which they are sent and warn the pilot of fog-screened obstacles in his course, are employed in an acoustic navigating device recently developed.

Similar in operation to the sonic altimeter which tells an airplane pilot his distance above the ground, the sonic locator, as the marine instrument is called, makes use of a megaphone which projects short blasts of a high frequency — 3000 cycles — air whistle, much as bullets are shot from a gun.

These blasts strike the obstacles in the path of the ship or on the shore line and return as echoes, which are picked up by a pair of receiving megaphones, or "ears." The captured sound is conveyed through acoustic filters and thence through a tube to the earpieces worn by the navigator.

When a pilot is feeling his way through a fog, he releases a short blast of the whistle every five seconds, while at the same moments an observer standing by presses a stopwatch held in his hand. The distance is determined by noting the number of seconds elapsing during the interval between the sounding of the blast and the reception of the echo.

Soundings are thus taken in this manner every five seconds.

Water-Foils Support HYDROVANE *Ship*

FOR years builders of ocean liners have been refining the designs of their vessels until it seems that the ultimate speeds attainable by the conventional hulls have just about been reached.

Promise of ocean speeds approaching that of fast airplanes is held forth, however, by a modified hydroplane type of sea vessel designed by H. G. Allan of Glasgow, Scotland, and illustrated in the drawing below.

As shown, the unique craft is essentially a streamlined hull supported on steel hydrovanes. These hydrovanes, planes, or water wings, as they may be described, travel through the water, but virtually on the surface. Ordinary hydroplanes, which are designed to avoid wave-making resistance, attain remarkable speeds but are unseaworthy in rough water.

Mr. Allan's craft, according to tests with models conducted by him, not only travels at top speed on smooth water, but is excellently adapted for skimming through heavy seas. The hydrovanes and the arms which connect them to the hull are thin and streamlined, enabling them to cut through the water in such a way as to eliminate rolling and pitching, even though waves may be 30 feet high.

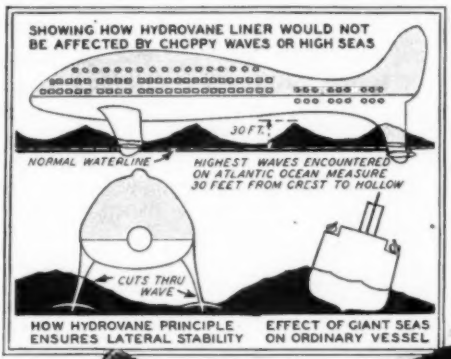
It may seem at first glance that the hydrovanes which support the ship are very small, but at high speeds they are adequate to support a heavy hull. The slower the ship travels, of course, the larger must be the supporting hydrovanes. The principle is the same as that which supports a stone skipping over the surface of the water—when forward speed slackens, the stone sinks.

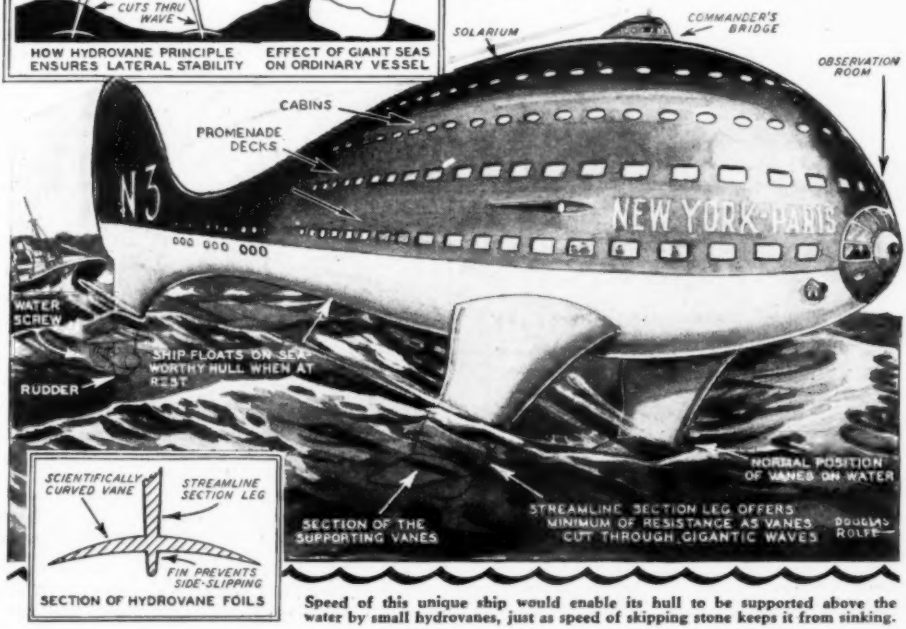
Floats on Surface When at Rest

In like manner, when the hydrovane ship ceases to move forward, the vanes sink into the water until the hull is floating on the surface.

The drawing shows a water screw under the rear hydrovane as the propelling medium. An air screw could be used, but would be less practical owing to the fact that head winds would slacken its efficiency to an extent proportionate to the mile per hour speed of the breeze.

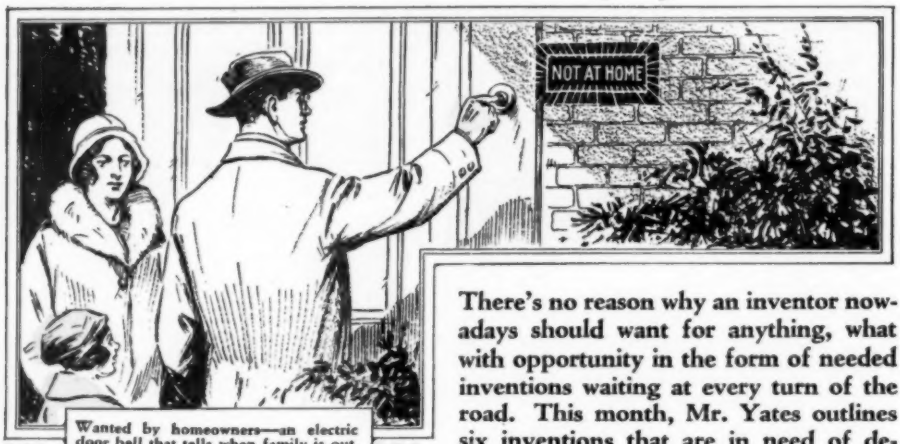
The idea of using hydrovanes for the purpose of lifting a craft above the water or reducing its draft is not new, but the theory and design of hydrovanes or water-foils has not been thoroughly understood in the past.


SHOWING HOW HYDROVANE LINER WOULD NOT BE AFFECTED BY CHOPPY WAVES OR HIGH SEAS
30 FT.
NORMAL WATERLINE
HIGHEST WAVES ENCOUNTERED ON ATLANTIC OCEAN MEASURE 30 FEET FROM CREST TO HOLLOW
CUTS THRU WAVE
HOW HYDROVANE PRINCIPLE ENSURES LATERAL STABILITY
EFFECT OF GIANT SEAS ON ORDINARY VESSEL



Speed of this unique ship would enable its hull to be supported above the water by small hydrovanes, just as speed of skipping stone keeps it from sinking.

Fortune Making IDEAS



Wanted by homeowners—an electric door bell that tells when family is out.

There's no reason why an inventor nowadays should want for anything, what with opportunity in the form of needed inventions waiting at every turn of the road. This month, Mr. Yates outlines six inventions that are in need of development, and which, if developed, certainly will bring home sizeable fortunes.

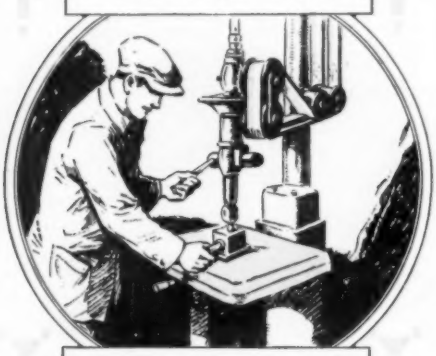
1. *New Electric Doorbell*

PRACTICALLY everything that we use today must sooner or later be invented over again. The common electric doorbell is a case in point. What is needed now is a doorbell that will flash "Not At Home" when the housekeeper is out or when she does not want to be disturbed.

Perhaps such a device could also be made to operate automatically so that when the door is locked from the outside, the flasher will automatically be cut into the circuit.

Specifications: Cheapness is the first consideration in this idea. The whole thing should not cost much more than the ordinary doorbell. The device should be made to sell in unit form so that it could be purchased and sold to people who could install it easily and without the need of an electrician.

Exploitation: Electric doorbells are one of the luxuries of American life and for that reason the device would need only to be patented in this country. It should be sold for about $15,000.



Machine shop workers need a device to sharpen drills right in the press.

Electric phonograph pick-ups now available are in need of improvement. Amateur electricians will profit immensely by devising a pick-up that works upon non-magnetic principle; which requires no adjustment during playing of record.

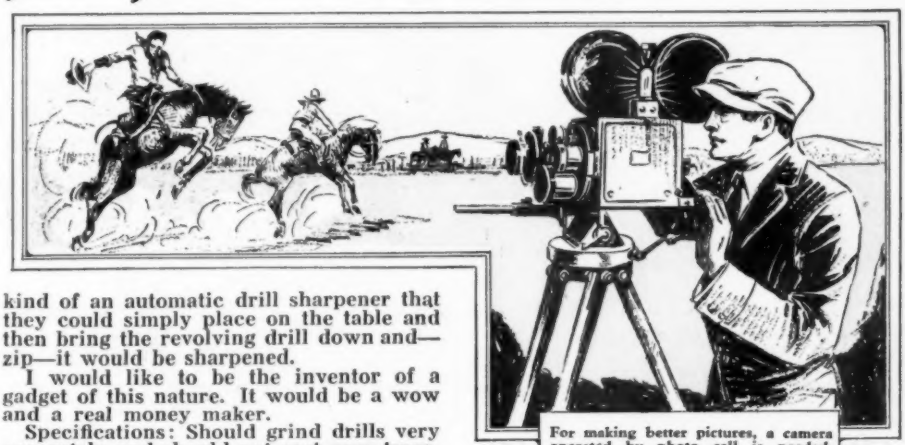
2. *Drills Sharpened in the Press*

HERE is a beautiful idea for you fellows who work in machine shops and who understand the importance of keeping drills properly sharpened.

Drill press operators in machine shops have to leave their work repeatedly and spend a considerable time at the grinding head keeping their drills in shape. It is obvious that a great deal of time could be saved if these men had some

for INVENTORS

by Raymond F. Yates



For making better pictures, a camera operated by photo cell is needed.

kind of an automatic drill sharpener that they could simply place on the table and then bring the revolving drill down and—zip—it would be sharpened.

I would like to be the inventor of a gadget of this nature. It would be a wow and a real money maker.

Specifications: Should grind drills very accurately and should not cost over twenty-five dollars retail.

Exploitation: Should be patented in the United States and all foreign countries and should be sold strictly on a royalty basis.

3. *Improved Phonograph Pick-up*

I was told by a radio engineer recently that one of the greatest problems facing the radio industry today—that is, one of the greatest technical problems—was that of finding an electrical pick-up for electric phonographs.

The devices now in use are most inefficient. First, they develop but a small fraction of a volt and therefore require very heavy amplification. The most serious objection, however, is their short life and the great difficulty of keeping them in adjustment.

What is needed and needed badly is a pickup based entirely upon a non-magnetic principle, one that will always stay in adjustment and never age. I am going to leave the matter in the hands of my readers with the feeling that I shall have the pleasure of recommending a number of patents, as I have invariably done in connection with each problem that is discussed in this department.

Specifications: A flat characteristic curve; that is, equal response in volume between the frequency limits of 100 cycles and 8,000 cycles. No adjustments and no magneto. Cost may be somewhat above the pick-up used at the present time, which is in the neighborhood of $1.50.

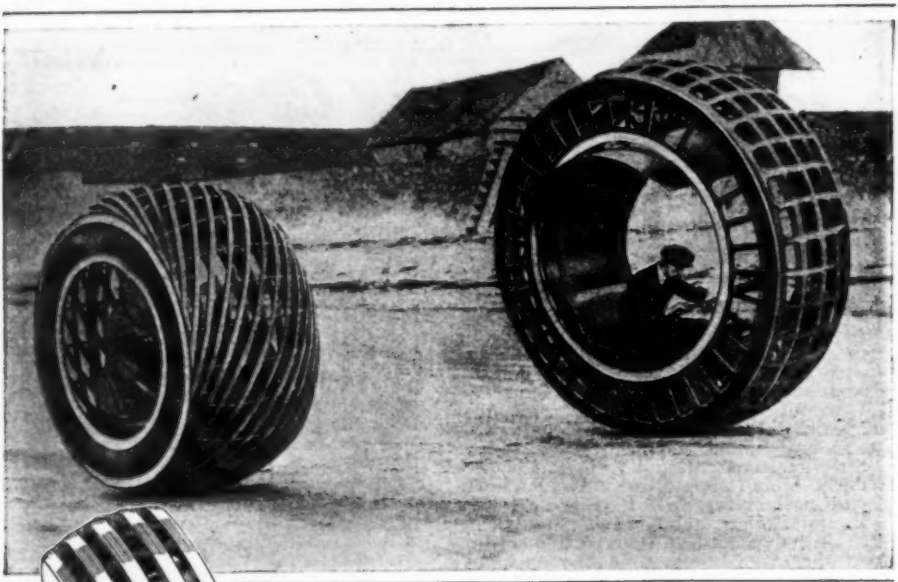
Exploitation: Patented in all the principal countries of the world and sold with large down payment royalty of 5% of the selling or 10% of the manufacturing costs.

(Continued on page 190)

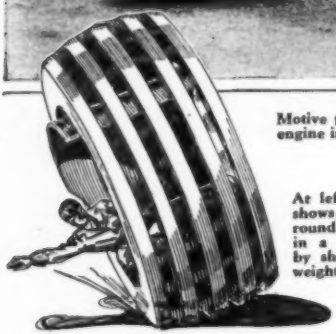
A fortune awaits the inventor who will perfect spectacles that "stay put."

A vast amount of time and labor is wasted by plumbers in threading pipes to take joints, tees, etc. What would be of greatest benefit here is an electric pipe welding device that would make perfect water-tight joints rapidly.

Dynosphere AUTO Runs on One Wheel



Motive power of the dynosphere, or one-wheel automobile, is supplied by a small engine in front of driver which runs on a geared track inside circumference of wheel.



At left—drawing shows method of rounding corner in a dynosphere by shifting body weight.

THE wheel is one of the oldest inventions of man and has been used for ages on all sorts of vehicles, but it has remained for an English inventor to build a complete vehicle out of one wheel.

As shown in the photo above, the "dynosphere," as its inventor calls it, consists of a wide-rimmed latticed wheel with a power plant inside its circumference, where the driver sits. There is also room for a companion in the seat alongside him.

Inside the wheel, on either side, tracks run completely around. The motor is geared to the track so that, when the engine is started, the motor pulls the track toward it and so starts the wheel in motion. Center of gravity is low to prevent the wheel from tipping over.

The weight of the motor and driver is sufficient to keep them always parallel with the ground—if the driving apparatus were sufficiently light, the motor might conceivably climb up the geared track instead of pulling it and the attached wheel around.

Dr. Purves is the inventor of the dynosphere, which has been tested on the beach at Weston Super Ware, England. Speeds of thirty miles an hour, with two occupying the seat, have been comfortably attained. The lattice-work in front of the driver's eyes disappears when the wheel is in motion, flashing past so rapidly that he has a good view of the road he is traveling.

Pocket Movie Projector

SIXTEEN millimeter film, used in amateur cameras, can now be viewed by running it through a tiny projecting machine which causes the film to move rapidly in front of the eye, under a lens, producing the same effect as if it were shown on a screen. The viewer is operated by a hand crank. Film jumps from frame to frame by its own elasticity, eliminating all sprockets and gears, so that there is practically nothing to get out of order.

Turning crank shows film in motion, thru magnifying lens.

Articulated Tail Increases the Maneuverability of Dirigible

A NEW feature in aircraft mechanics, the use of an articulated tail and nose comes to the front in the plans for the "slipstream dirigible" now being laid. The specifications call for the installation of such a system in both the mooring and steering apparatus of the new craft.

In dropping the old style hinge joint in rudder and elevator and incorporating the universal joint the inventor, G. W. Peck, of Los Angeles, believes that it will make for greater maneuverability in the handling of the huge ship and also eliminate, totally or partially, the necessity of ground crews.

The photo on the right shows how the tail will be installed, allowing complete freedom to the steering apparatus. A similar installation in the nose of the craft will simplify the parking problem.

Steering rudder in rear of dirigible is operated on a universal joint which facilitates handling and makes the operations and movements of the huge ship more certain.

Rowing Machine Builds Muscles

ROW, row, row your boat—but don't go in the water. Rowing machines of all types have become popular as exercising devices both in this country and abroad and many different "types" of apparatus have been developed.

The latest machine from England, shown below, claims to be one of the least expensive on the market. The strong springs along the bottom of each side offer the muscle-building resistance when the operator works the "oars."

When operator pulls oars backward, muscle-building resistance is offered by the strong springs on the sides.

Pronunciation Taught by Records

A GROUP of test sentences devised to show slight variations in the pronunciation of English is being used in London by speech experts, who are studying the dialects in that city as a part of the efforts of educational authorities to improve average London speech.

Phonograph records have been made of the proper way to pronounce the test sentences and are being distributed to the schools so that the children will have models to follow in their study. These lessons are also being broadcast from the government's radio stations.

Mineral Wool Is Made From Rock

MINERAL wool is not really wool, but a fiber produced by melting rock to a glass-like condition and blowing the glass into fine, white, wool-like threads.

The wool is derived from two kinds of rock; one a highly calcareous type with a small amount of magnesia, and another containing silt, clay, silica, and some magnesia and lime.

Bottle Labels of Adhesive Tape

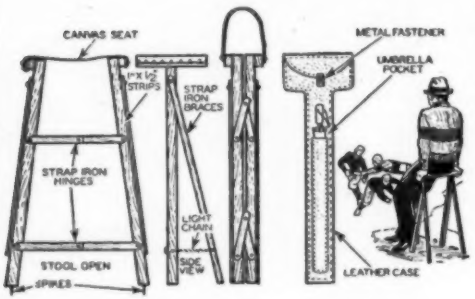
ONE of the easiest and quickest ways to make a label for a bottle is to use adhesive tape. Medical tape — a cheaper grade intended for use in mending garden hose and other articles —or painters striping tape can be used.

Just cut off a strip from the roll, write the symbol for the contents of the bottle on it with grease paint, a piece of wax crayon, or waterproof ink, and stick the label on the bottle. This label will adhere tightly but can be removed very easily.

Symbol for bottle's contents is marked on adhesive tape and pasted on side of bottle.

HANDIKINKS

Handikinks department brings you a number of miscellaneous items and stunts each month that are easily made, and which other readers have found useful around their home, garage, or workshop; in fact, any place where work is done.

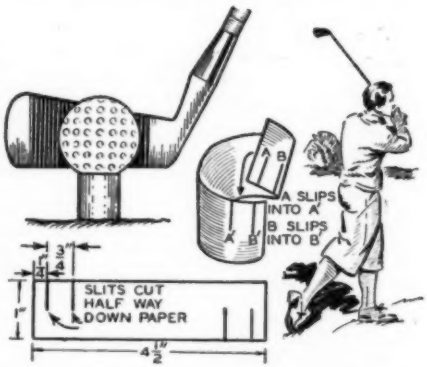


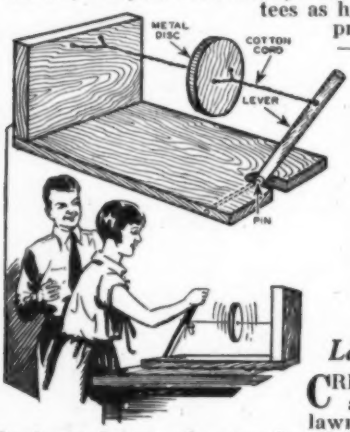
Folding Stool for Football Fans

"STANDING room only" needn't mean that you have to stand to watch the game if you have a portable stool like this. Decide on the height you want it to be and cut two strips that long from 1 by ½ inch wood. Get two strap iron braces about two inches shorter than wood strips and fasten one to each strip so that loose ends hang flush with bottom. Brace the wood strips with two strap iron hinges and the iron braces with chains.—John Hawthorne.

Drive Golf Balls From Paper Tees

IF YOU are dissatisfied with sand and wood tees, try making your own out of paper. You can manufacture them just as high or low as you wish. Cut out a strip of paper 4½ inches long and, for experiment, 1 inch high. Laying the paper lengthwise, mark off lines ¼ and ¾ inch in from each end. In diagonal corners, cut on lines half way down paper, forming slits, as shown at the right. Make strip into cylinder by inserting slips, as shown, and your tee is ready. Cut additional tees as high as you prefer them. —Ivan Morris.



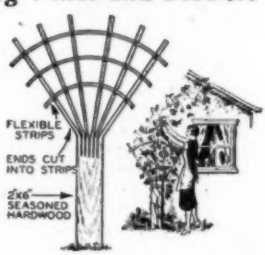


Youngsters Will Have Fun With Disc Toy

THIS disc toy will amuse children for hours. A glance at the accompanying drawing shows how it is made. The lever is held in place by a metal pin run through a hole drilled through base board. Whirling motion of the disc is created by operating lever back and forth, causing string to wind and unwind. An amusing stunt is to draw colored lines on the disc, which can be made of cardboard, and watch the color combinations resulting when disc rotates. —Lester P. Young.

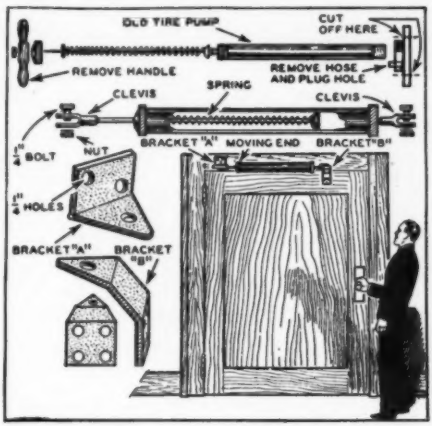
Lattice Prop for Climbing Vines and Flowers

CREEPING vines and flowers add to the beauty of your lawn. To get away from the hackneyed type of cross-piece lattice work, make a lattice arc like the one shown here. Take a piece of 2" by 6" seasoned hard wood and cut one end into 1-inch strips running about 3 feet down board. If they will not spread easily, steam for awhile over a boiler. Then spread in arc shape and nail three flexible strips across to hold them in shape. Set deep enough in ground to make it solid in the wind. Pieces of string may be used to guide new plants up the base of the arc until long enough to entwine in lattice.—James Murphy.



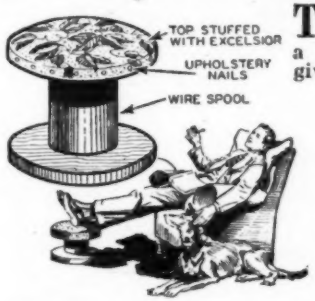
Kinks Lessen Housekeeping Labor

Old Pump Makes Good Door Check



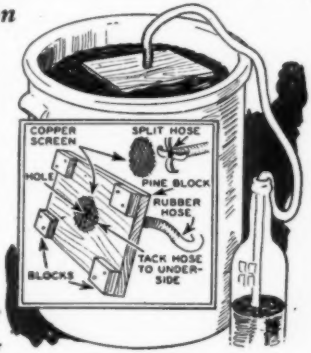
WHY not make an efficient door check out of that old automobile pump you have? This is done by removing the handle and cap of the pump and installing a strong spring just long enough to push the rod "home." Obtain two clevises the size used on model "T" Ford emergency brakes. After cutting a thread on the top of the pump rod, install one clevis. Saw off the foot braces and drill a hole through the bottom. By using a stud, fasten the other clevis into the bottom. White lead on stud will prevent air leaks. Attach check to door and frame with two brackets. —William Tatina.

Rest Your Feet on This Comfy Stool



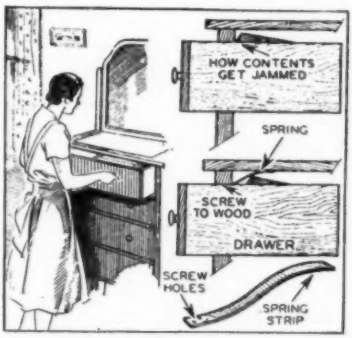
THERE'S nothing like a foot rest to give you a feeling of comfort when you settle down in your favorite chair for a smoke or a rest. This one is made by upholstering one flange of a wooden spool, the kind used in hardware stores to coil wire on. Stuff it with excelsior, cotton padding, or anything you have. Sandpaper exposed woodwork, and paint or stain.—Hi Sibley, Jr.

An Automatic Siphon



SIPHONING home brew from a jar without drawing dirt or settlings is made easy with these blocks and screen. Select the float block and put 1-inch blocks under each corner. Now drill a hole in the middle of the float and push the siphon hose through. After splitting the ends, fasten them to the under side of the float and nail a piece of fine mesh screen over the intake. Wood will float on top of brew and the screen will keep out undesirable material. Settlings will not be siphoned because blocks will rest on bottom keeping intake from base of jar.—Harvey Sutton.

Springs in Drawer Prevent Jamming



OVERFILLED drawers have a habit of jamming because the contents protrude and catch against the cross-beam above the drawer. This trouble can be eliminated easily. Cut three or more 6-in. strips from the core of a heavy victrola or clock spring. Bend and drill as shown and tack them to the underside of the cross-beam.—Andy Doobit.

Utility Can Opener

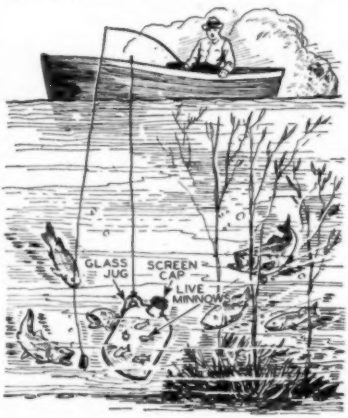
REGULAR can openers cannot always be found when you want one. That is why it is a good thing to have a utility opener always at hand. With a steel drill, bore a small hole in blade of old knife about ⅜ inch back from the point and large enough so that a lath nail can slide in it.—S. T. Dahl.

Home Comforts for Camping Trips

Camper's Night Torch From Pop Bottle

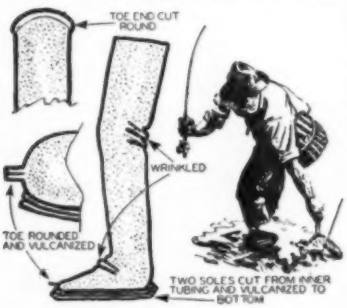
A CAMPER'S torch or emergency outdoor light can quickly be improvised from a pop bottle and a stick. Cut a slit in the top of a metal bottle cap that will fit tightly back on the bottle, and insert a long wick that will reach the bottom of the bottle. A substitute wick can be made by folding cotton cloth. Lash bottle to a stick and fill it with kerosene. When the wick is saturated, light your torch. It gives a large, yellow light that will burn in a high wind.—L. B. Robbins.

Minnows in Glass Jug Attract Fish to Hooks



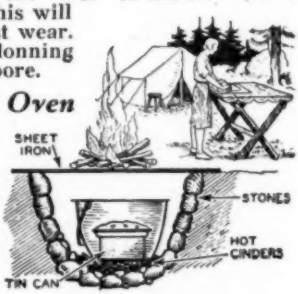
NO SITTING around waiting for "bites" when you use this fishing lure. It's a "sure fire" drawing card for still fishing. To make it, all you need is a two-quart or gallon-size glass jug. From a piece of screen, cut a circle large enough to fit over the top of the jug. Then remove the cap from the jug and cut out the top of it so that just a slight ridge remains around the top. Fill the jug with lake water and put a few live minnows in it. Place the screen over the mouth of the jug and screw the cap over it. Tie a string to the jug and drop it over board. Fish are attracted to the minnows.—"Bob" Poulson.

Rubber Boots Made From an Inner Tube



EVERY sportsman can make use of a pair of rubber boots. Those who have none can easily make a pair from a large size inner tube. Before cutting, test for leaks and patch any that are found. Measure off two pieces to the desired length, allowing ample room for your foot. Round off the toe-ends and vulcanize each strip where the foot is to be. Now cut four soles, two for each boot, and vulcanize them to the "feet" of the boots, one on top of the other. This will strengthen them against wear. Remove shoes when donning the boots.—Thomas Moore.

Here's How to Bake Pies and Meat in Ground Oven



FRESH baked foods certainly are a treat when camping out. A cook oven that will bake your pies, breads and meat to a rich brown is made by digging a hole in the ground about 2 feet deep and 2 feet wide. Line the hole with rocks and cover with a piece of sheet iron. Light a fire on the iron and the heat from the cinders and the fire will bake your food.—John Warren.

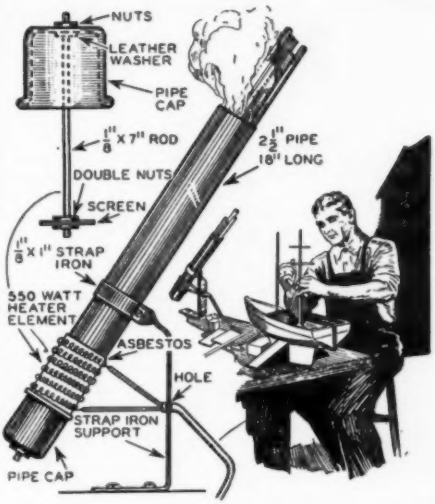
Bread Box for Camp

A GOOD camp bread box can be rigged up from an ordinary marshmallow tin. To have a cutting board always handy, cut a piece of three-ply veneer slightly smaller than the size of the top and rivet it to the inside of the lid. The board is always handy, and is out of the way and protected when the tin is closed. The holes around the rivets are filled with plastic wood.—W. F. Merchant.

New Wrinkles for Workshop Fans

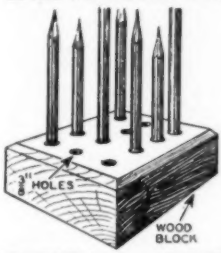
Simple Steamer for Model Wood

THE model builder usually encounters a great deal of trouble when steaming his wood. Here is an electrically heated steamer that bolts to the corner of your workbench and is always ready for use. The steamer body is made from a piece of 2½-inch pipe; one end of which is threaded and fitted with a cap. Two thin turns of asbestos sheeting are wrapped around pipe where the coil is to fit. Over these are wrapped the wire coils taken from a 550-watt heater element. Three more layers of asbestos are wrapped over coil to prevent charring insulation on the electric lead-ins and accidental burning of hands. The ends of the heater element should be pulled through the asbestos and connected to plug-in extension. So that material does not touch water, a stop made from medium mesh screening is placed in the pipe about ½ inch above water level. Screen is fastened to the pipe cap. The steamer is held by a strap iron frame which is bolted to the top of the work bench in an out-of-the-way place.
—Oscar Gleason.



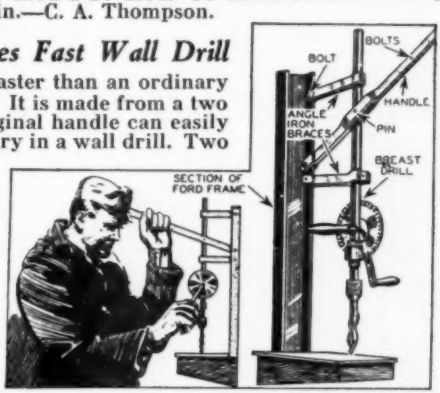
Desk Pencil Holder Made From Drilled Wood Block

A PENCIL holder is a handy kink for an office or writing desk. This one can be made in a jiffy from a wood block of either square or oblong proportions. Select the top side and bevel off the edges about ¼ inch. Then lay out, either in straight lines or in design, the spots for the pencil holes. To have the pencils fit neatly, a ⅜-inch drill should be used. To finish off the holder, sand it down and stain.—C. A. Thompson.



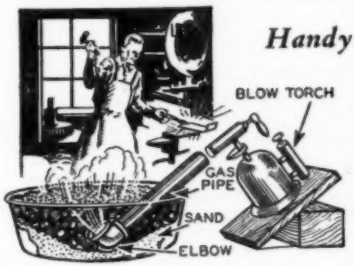
Breast Drill Makes Fast Wall Drill

HERE is a wall drill that will work much faster than an ordinary drill and which allows for great leverage. It is made from a two speed Shellburne breast drill because the original handle can easily be replaced by the longer, heavier rod necessary in a wall drill. Two pieces of Ford frame are ideal for mounting, though angle iron can be used. The handle is made from two pieces of steel 1½ by ⅛ inches, which are bent out to fit around the sliding rod and bolted. A slot about 2 inches long in the handle is necessary for the sliding rod. The gear ratios are 1:1½ and 1:3½ making the drill good for light and heavy work. The chuck takes drills up to ½ inch size. More accurate work can be done with this drill because pressure can be applied with uniform firmness.—Robert Martin.



Handy Workshop Forge Made From Blow Torch

FEW farm or home workshops are provided with a forge, but when the occasion arises where light welding is necessary, a practical little forge may be improvised from a blow-torch. A short piece of gas-pipe provided with an elbow is inserted into a pan partially filled with sand as shown at the left. Blacksmith's coal is heaped over and around the opening of the elbow. Mount the blow-torch on a board, and with a support tilt the torch so as to direct the flame into the gaspipe. This forge will provide sufficient heat for most any welding job.—G. E. Hendrickson.



Stunts for Motorists

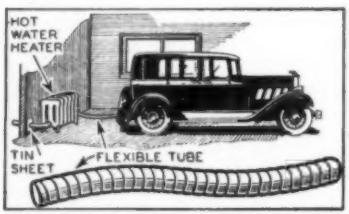
Flexible Paint From Inner Tube and Pitch

AFTER the winter months, barrels, wooden tanks and troughs always need waterproofing, car tops re-dressing, and pitch roofs re-coating. A good, inexpensive flexible paint can be made by placing an old inner tube in a can or bucket set on a fire built in the open. After the rubber melts in the can, add an equal amount of pitch from old dry cells. When this mass has melted, remove the bucket from the fire and add enough gasoline to give the mixture the consistency of paint. A good roof coating or top dressing that will not crack, chip or peel, is made by stirring in a little lamp black. —Don C. Higbee.

New Tail Light Sign Advertises Business

ADVERTISERS agree that keeping your name and your business constantly before the public is a profitable achievement. One way to do this effectively and inexpensively is to make a display sign out of the rear light on your car. This is done by replacing the back lamp with an old headlight. After cleaning the glass thoroughly, outline your sign on the glass with open letters and then fill in the background with red paint like an ordinary "stop" light. This sign will attract attention wherever you have your car and can be read easily both day and night.—Chet Sullivan.

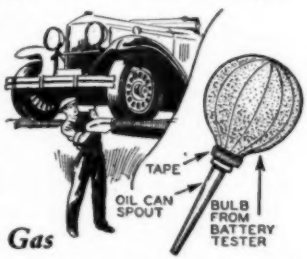
Use Car Exhaust to Heat Your Garage



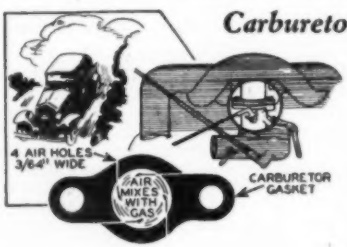
HERE is a novel way to heat your garage. Place a cast iron hot water radiator in the rear of your garage and run a pipe from one end through the garage wall. Next get a 3-foot piece of flexible tubing of a size that will fit tightly on other end of radiator. Back your car into the garage and slip the loose end of the tube over the exhaust pipe. Run motor a few minutes, and exhaust going through radiator will then warm garage. Pipes will retain the heat for hours.—William Tatint.

Mechanic's Handy Oiler Made From Used Battery Tester Bulb and Spout

THE mechanic will find much to appreciate in a convenient oiler that can be made from a battery tester bulb. Procure a medium size spout from an oil can and screw it into the mouth of the bulb. To be sure this connection is tight, wrap with tape. The oiler is filled by the same operation as an eye dropper or ordinary bulb syringe. Oil can be squirted upward for some distance with this oiler and many joints can be oiled that are inaccessible with a tin can oiler. It is convenient to handle because the hand action in forcing the oil is not as tiresome as with a tin oil can.—Edward Sievers.

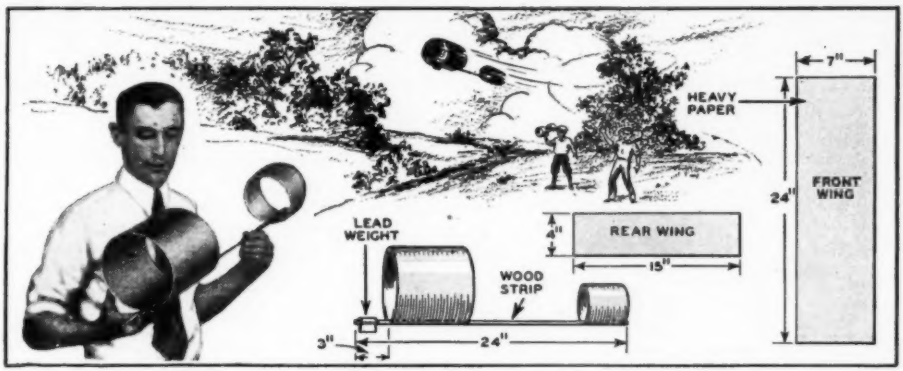


Carburetor Gasket Vaporizes Gas



GETTING more speed on less gasoline is easily accomplished by installing one of these gaskets in your carburetor. To make it, get two gaskets for your carburetor and cut one into four pieces, as the diagram shows, trimming a little shaving from the ends of each piece. Then glue the pieces on to the whole gasket, leaving the four holes shown for the air to pass through. The suction from the motor will draw a small amount of air through these holes and vaporize it by the whirling motion.—Erwin Cook.

Cylindrical-Wing Racing Glider

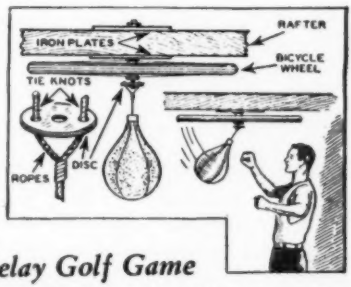


Hold the glider lightly between the two wings and send it soaring into the air by either a side-arm or an over-arm swing.

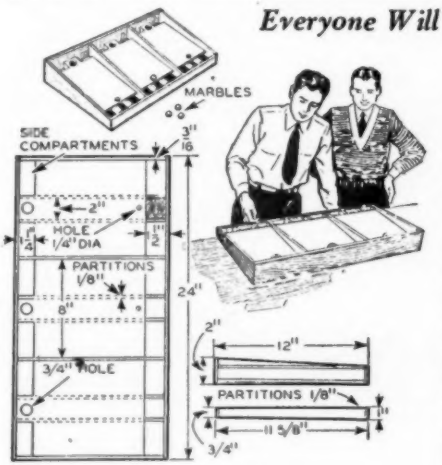
IF YOU want to build a glider in a hurry and still have one that will give them all a good race in sailing, build one of these cylindrical-winged contraptions. To make the wings, get a good piece of strong, heavy paper and cut out two rectangular-shaped pieces; one 7″ by 24″ and the other 4″ by 15″. Glue these into cylindrical shapes. At the extreme end of a 24″ piece of ¼-inch wood strip, fasten the smaller cylinder, or wing. Likewise, 3 inches from the other end, fasten the larger wing to the wood strip. A lead weight is fastened about ⅛ inch from the end of the large wing. Adjust this weight by trial flights. Weight protects glider from wrecking when falling.—Douglas Hoffman.

Punching Bag Stand From Bicycle Wheel

THE front wheel, with inflated tire attached, from an old bicycle, or from one put up for the winter, will make a good punching bag stand. The axle is replaced by a bolt long enough to go through a heavy beam. The bolt should run through iron plates both above and below the rafter to give the stand solidity. The lower end of the bolt goes through the wheel and is fastened to a disk about 1 in. below the hub. The bag rope is divided at the end and run up through the holes in the disk to allow for a free swinging point. Knot rope ends above disk.—Bill Donney.



Everyone Will Enjoy Relay Golf Game



THIS game of relay golf will fill in a lot of idle moments at home or at a party because everyone can play it. Follow the instructions on the accompanying diagrams and the game board will be easy to make. The object of the game is to get as many balls as possible into the third pocket. Each player is given five balls, or marbles, ½ inch in diameter. The player sets one ball on the board and knocks or taps in towards the hole with his finger. Do this with all balls. The ones that fall into the side pockets are left there. Those that go into the hole and drop into middle pocket are taken out and played on the second board. In like manner, those going into the center pocket are played on the third board. The player who rolls the most balls into the third middle pocket wins. Another way to play the game is to have each player go through the process three times. The winner is the one having largest total at the end.—Donald W. Clark.

Scissor-Grinder Pedals His Bike to Turn Emery Wheel

Belt from bike sprocket to supplementary wheel drives emery wheel when scissor-grinder operates bicycle pedals.

PEDALING our bicycle with the rear wheel jacked up off the ground wouldn't get most of us anything except exercise, but the scissor-grinder on the left finds the motion a great help in earning his living.

A small belt is run from the bike sprocket to the supplementary wheel which in turn drives the grinder. This extra wheel is used to increase the speed of the sharpener, which is fastened above the handle bars.

One Proven Cause of Stammering

EXPERTS now agree that any interference by teachers or parents with the natural left-handed or right-handed preference of a child is likely to result in stammering or other disturbances of speech or even the mind. This fact has been proven by a series of experiments with children showing both tendencies, with the results consistently the same.

No More Cinders on Train Trips!

ENGINE crews on fast trains often find that smoke and cinders from the stack of their locomotives fly into their faces and obscure their sight.

As a means of preventing this, the Canadian National Railways recently equipped the locomotives running between Montreal and Toronto with a special type of smoke distributor.

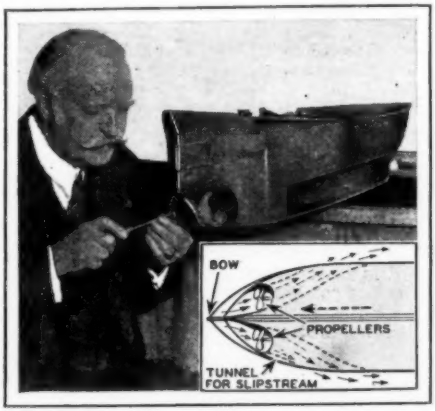
The distributor consists of an open metal box placed in front of the engine stack, so that while traveling, an air current is produced forcing the smoke and cinders up in the air. This not only keeps the smoke away from the engine cab, but lifts it high enough to clear the last car of the train.

Distributor deflects smoke and cinders upward over engine and cars by air current which enters box in front of stack.

Bow Propellers Boost Ship Speed

WATER transportation of freight will be speeded considerably within the next few years if the propulsion system devised by Louis May, Pittsburgh inventor, will do all that he says it will.

His system makes use of a set of forward propellers which he claims will give more speed, power and acceleration to freighters. He is shown below with a miniature ship equipped with the forward propellers, which are set in slip stream tunnels in bow of the boat. The arrows in the diagram indicate how the propellers throw the water backward to attain forward motion.



Two propellers are set in slip stream tunnels in bow of boat, one on each side. The revolving action sends the water back along sides, as indicated, giving ship greater forward speed.

What Science Knows About Earth

SCIENTISTS have sufficient evidence to be reasonably sure that they know the earth's shape, as well as its size, its respective land and water areas, its average density and the average density of the rocks exposed on its crust.

These densities are not the same, the earth as a whole being about twice as dense as its surface rocks. The temperature of these rocks increases about 90° F. for each mile of depth so far explored.

Study of the shock waves set up by earthquakes shows that the rocks are solid and rigid for only about 60 miles beneath the surface. Below that, the earth is plastic, like hot glass.

PLANE TALK

Edited by DOUGLAS ROLFE

Glider Characteristics Recorded for Designers

THE matter of checking actual performance data against design theory is always a subject which interests those of an aeronautical trend of mind. With full-sized airplanes, one has known power inputs, and can pretty well check performance against power. But in a glider the story is different.

A flight is made, and it may be a long one, or a short one, with no measured method of checking the rate of climb, duration, load and so on except by the hunch-and-guess-so method. This leaves much to be desired.

Leaves Little to Guess Work

Mr. H. B. Henrickson, a glider pilot of Washington, D. C., has designed a unique articulated registering device which plots the glider's climb against angle of attack, distance flown and time in the air.

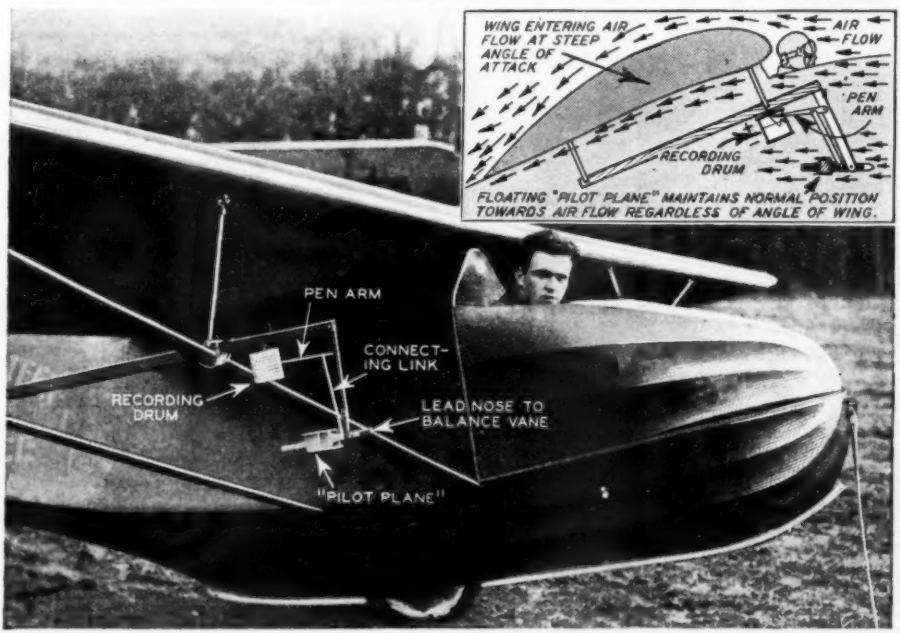
With this device such ships as the Bowlus glider and others have been checked for climbing characteristics and in no other way can the inherent soaring or gliding abilities of a ship be brought out.

It works this way: There is a small drum which is rotated by clockwork or an anemometer. There is an articulated arm with parallels which has a small wind vane or pilot plane which stays normal to the flow of air.

Record of Flight Given

There is a stylus which records the changes in angle of attack on the drum. As the ship rises the drum rotates a given amount for a given length of time. Against the time in the air is plotted on the drum the position of the wing (angle of attack) relative to the normal flow of air.

Thus a record of each flight can be made, and an average struck. Results are then a matter of mathematical averages rather than the impressions of pilots taken over a series of flights.


WING ENTERING AIR FLOW AT STEEP ANGLE OF ATTACK
AIR FLOW
PEN ARM
RECORDING DRUM
FLOATING "PILOT PLANE" MAINTAINS NORMAL POSITION TOWARDS AIR FLOW REGARDLESS OF ANGLE OF WING.
PEN ARM
CONNECTING LINK
RECORDING DRUM
LEAD NOSE TO BALANCE VANE
"PILOT PLANE"

The matter of measuring actual angles of attack against known performance is readily accomplished with this device, the invention of H. B. Henrickson, who has been flying gliders a long time. His device is extremely useful.

At What Point will the

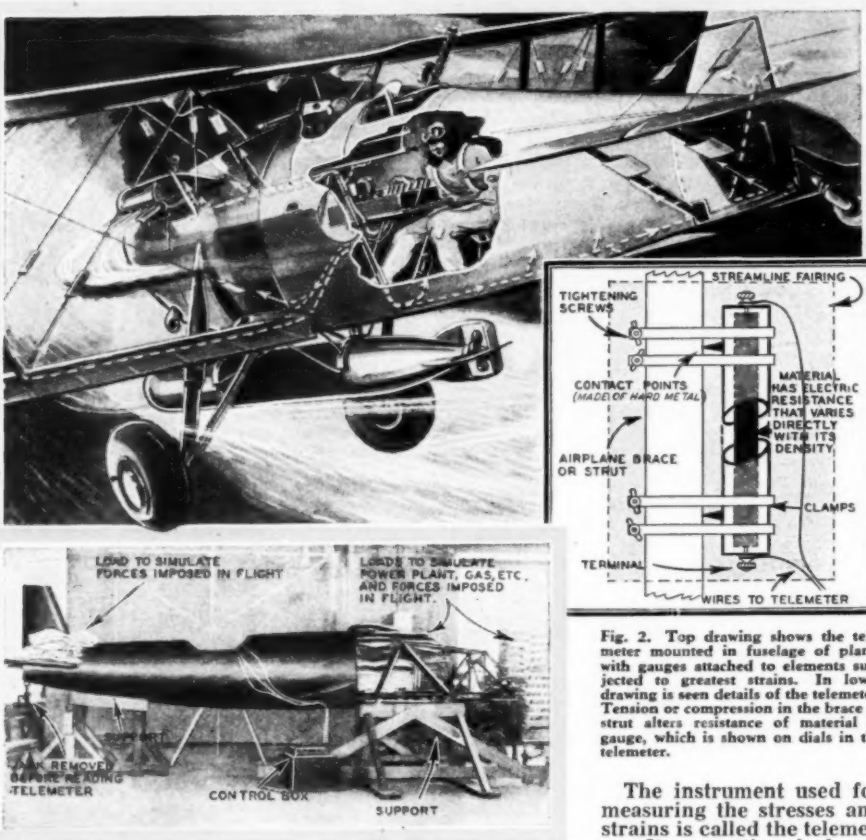

LOAD TO SIMULATE FORCES IMPOSED IN FLIGHT
LOADS TO SIMULATE POWER PLANT, GAS, ETC., AND FORCES IMPOSED IN FLIGHT.
REMOVE BEFORE READING TELEMETER
CONTROL BOX
SUPPORT

Fig. 1. Above is shown plane with metal skin type fuselage undergoing laboratory test with telemeter. Dials of strain gauge on control box show movement of metal skin when carrying the load of lead on fuselage to simulate load carried during flight of plane. Loads on front of plane are measured in same manner.

Fig. 2. Top drawing shows the telemeter mounted in fuselage of plane, with gauges attached to elements subjected to greatest strains. In lower drawing is seen details of the telemeter. Tension or compression in the brace or strut alters resistance of material in gauge, which is shown on dials in the telemeter.

IN THE days of the stick and wire airplane it was exceedingly difficult to determine the weakest point of the structure. This was particularly the case after the plane had been in use for some time, as it is practically impossible to state definitely how much wood has deteriorated.

Now that metal has taken the place of wood in practically all planes, science has made it possible to actually measure the stresses and strains in the different members of a plane either on the ground or during flight.

Thus, as the strength of the parts are known, the factor of safety of each member is known at once. In this way the weak parts are discovered before the plane is put in service and accidents prevented.

The instrument used for measuring the stresses and strains is called the telemeter. Its operation is based upon the principle that metal parts under tension are stretched and those under compression are compressed. If any device is rigidly attached to two points of any member, the device will stretch or be compressed in direct proportion to the airplane part.

Now if within that device there is a material whose resistance to an electric current varies with its density, a direct reading of the amount of elongation or compression of the airplane part is available. Once having the actual amount of movement within the part when subject to the forces imposed, the pressure applied is merely a matter of computation.

The telemeter is constructed in such size that it can be carried aboard an airplane. The lower photo in Fig. 3 shows the instrument mounted within the fuselage of the plane. The dials for reading the resistance

Airplane Break First?

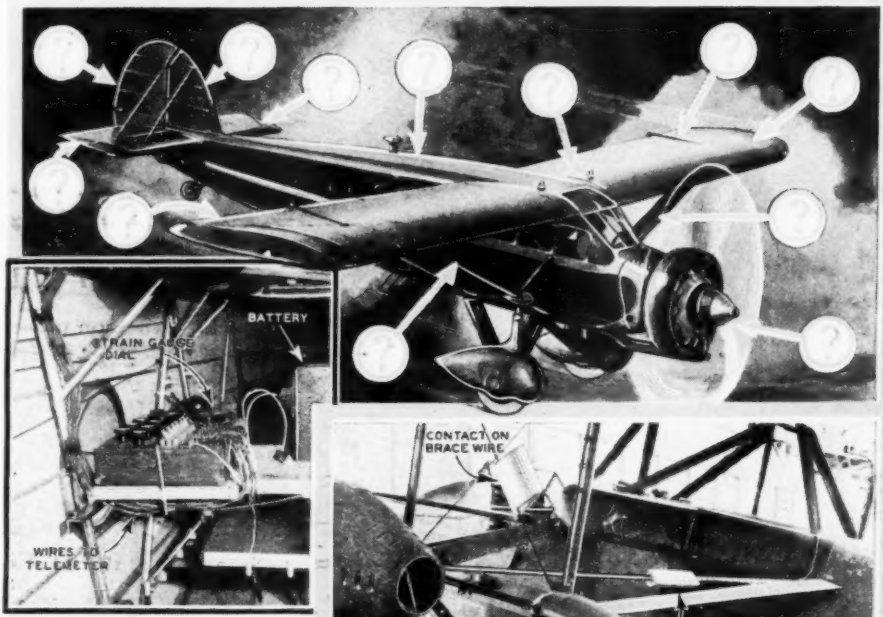


Fig. 3. Parts of plane subject to greatest strain in flight, and which cause anxiety to engineers, are indicated by question marks in top drawing. Lower photo shows instrument mounted within fuselage of plane. Note the various terminals which lead to strain gauges mounted at various points about plane.

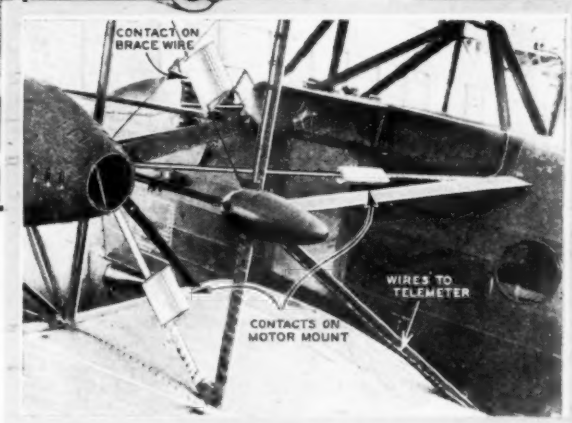


Fig. 4. Method of mounting gauges on engine nacelle struts are illustrated here. Gauges are well streamlined and can be attached to any metal member of plane for determining compression or tension. Cables connect the gauges with the telemeter in fuselage.

of the various strain gauges can be seen on top of the control box. Note the various terminals. Each one is connected with wires leading to a strain gauge mounted somewhere on the plane. Switches make it possible to obtain a reading of any of the strain gauges at any time.

Fig. 4 shows the strain gauges or contacts mounted on the engine nacelle struts. The gauges themselves are well streamlined and the wires are all firmly attached so that they will not flop around in the airstream. Note that the gauges can be attached to any metal member, as in this photo two are fastened to struts and one to a cable.

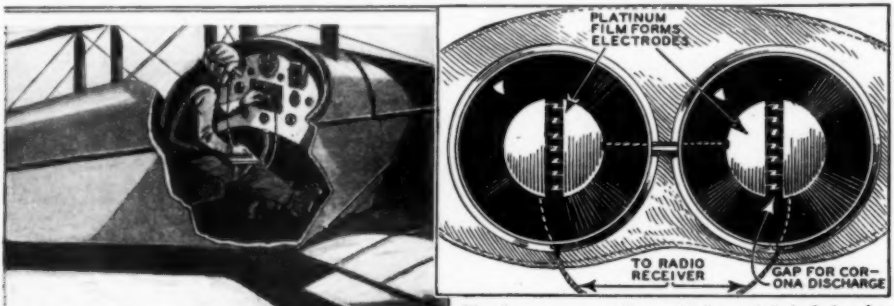
As the all metal fuselage type of plane is becoming more universally used it is extremely important to know the strength of and the strains imposed upon its metal skin. The metal covering of these fuselages carry most of the strains imposed as there are practically no interior members to carry the load.

Fig. 1 shows a laboratory test of such a fuselage. Note the load of lead mounted on the fuselage to simulate the load carried during flight. The telemeter strain gauge measures the movement of the metal skin when carrying this load.

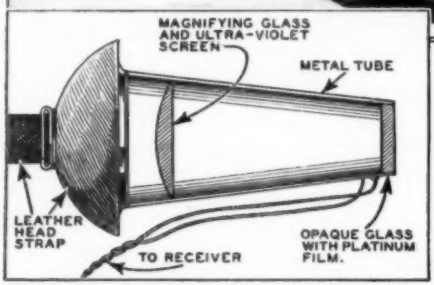
Fig. 2 shows also the details of the strain gauge. The resistance element is elongated or compressed the same amount as the member of the plane to which attached. The electric current must pass through the resistance element. As this element elongates or contracts, the resistance changes. The telemeter gauge indicates this and gives the necessary information to determine the exact amount of movement.

As the telemeter can be carried into the air, it is possible to find out the forces transmitted through the various parts with the plane in various flying positions.

Pilots Get Messages Over "Sight Radio"



Plane's operator or pilot reads dot and dash flashes from the sparks jumping across the hair line gap scratches over the platinum foil on the glass at end of the headpiece tube.



The head piece through which the plane's operator views the spark discharge is shown in drawing above. Spark flashing at end of the tube is magnified by the enlarging lens.

EXPOSED to the overwhelming roar of the twenty-four cylinders of a giant trimotored plane, radio operators or pilots at the receiver sometimes find it almost impossible to decipher weak or even moderately loud signals with any degree of certainty. The result is frequently a perilous mistake in an important message.

Two Buffalo radio experts, F. Derringer and P. Eichner, have worked out a new and practical answer to this problem. In the development of their optical radio receiver they have substituted sight for sound.

Instead of producing dots and dashes in a pair of head phones, the Derringer-Eichner system shows flashes of light in a pair of special light-sealed glasses fitting over the head like a pair of goggles.

The glasses at the ends of the tubes are covered with a thin film of platinum which serves as electrodes for the sparks as shown in the accompanying drawing. A magnifying glass placed in the position shown enlarges the view of the spark.

When the plane's operator becomes accustomed to sight reading he can decipher messages much more rapidly and accurately than by ear.

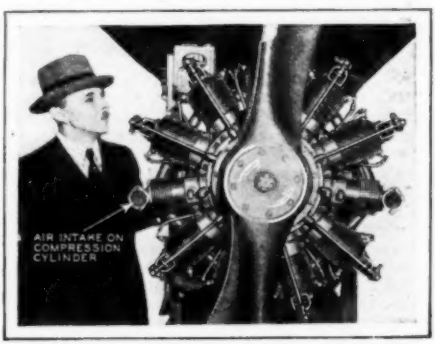
New Beckman Airex Plane Engine Has Exhaust Valves in Cylinder Head

CUTTING fuel consumption in half at high speed, reducing the weight per horsepower by half and the number of moving parts about 20 per cent, and doubling the performance—these are the advantages of the new Beckman Airex aviation engine recently introduced, which promises to open up a wide range of application for larger power units in the aircraft industry.

Similar in appearance to the Wright and Pratt and Whitney types of motors, the Beckman Airex engine has no carburetor. The gas is forced into the cylinders from a fuel pump working under a pressure of 75 pounds per square inch, and mixed with air from two superchargers just before entering the combustion chamber.

Vaporizing of the fuel is accomplished through a spray nozzle with the air at 20 lbs. pressure. Fuel is taken into the cylinders through ports at the end of the piston stroke. As shown in the accompanying photo, exhaust valves are located at top of each cylinder head.

The motor has a piston displacement of 754 cu. centimeters, and develops 350 h.p. at 2,000 r.p.m.



A close-up view of the new Beckman Airex engine, showing position of the air intake. Nine cylinders develop 350 h.p.

"Balloon Cops" May Clear Traffic Jams

THE traffic tangles caused by major football games has become a problem of great importance to those cities that have the larger stadiums within their bounds. For hours before and after the games the police are compelled to work at top speed to restore the normal movement of traffic, being called upon at times to handle some fifty thousand additional cars.

At the various traffic conventions held about the country this problem has received much attention but it was only recently that a plausible solution to the matter was offered.

50,000 Cars Controlled by One Man

Police departments have realized right along that these great traffic loads, reaching peaks that were as high as thirty thousand cars above normal, made co-ordination practically impossible with existing methods. What was needed was a traffic dictator sitting in some exalted position and lord of all that he surveyed. The captive balloon system, it was found, would provide these accommodations, giving a single man the opportunity of seeing the traffic jam as a whole and providing him at the same time with the necessary signal apparatus to direct the movement of vehicles on every street in the congested district.

In this way, motorists, even though well-meaning, would not be working to the disadvantage of each other, nor would they be defeating the very thing that they were trying to accomplish.

"Balloon Cop" Operates Stop-go Lights

In the scheme devised special traffic signals would be installed and these would be of a portable nature so that the signalling and telegraphic departments of the police could install them in a few hours. Carried up with the captive balloon would be a large cable containing the nerve centers of the entire system that would terminate in a master-control switchboard spread out before the great traffic god who by the mere manipulation of switches would rid the traffic-burdened city of its excess vehicles in one hour, instead of the customary two or three hours now required.

This dictator would operate switches but he would also have clasped to his chest a telephone that would put him in touch with motorcycle cops at strategic points. The motorcycle cops would be immediately dispatched to points having minor accidents so that the various arteries could be kept open.

HEAVY MOTOR TRUCK WITH BALLOON WINCH
COMBINED GUY ROPE AND TELEPHONE AND SIGNAL CABLE
CAR FROM WHICH TRAFFIC OFFICERS CONTROL ALL TRAFFIC ON CROWDED ROADS
RIP CORDS
TELEPHONE TO GROUND TRAFFIC OFFICERS
SWITCH-BOARD
CLOSE VIEW OF BALLOON CAR

In system recently proposed to solve traffic congestion problem around a stadium, a supreme traffic cop from station in car of captive balloon manipulates street stop-go signals over switchboard, and dispatches motorcycle police with phone.

With a sufficiently powerful motor Whizzer can step out handsomely. Here is an answer to thousands of river and shoal-draft boat bugs who have asked us for an air-drive speeder. Air drive introduces new ideas on boating as Westy Farmer, hydroplane authority, explains in this article. With a 25-horsepower light weight motor she'll do around 23 m.p.h.

"Whizzer"—a Hydroglider

by **WESTON FARMER**

At last! Here's the long looked for air-drive speeder which our shoal draft boat bugs have been looking for. Souped-up motorcycle conversions will furnish good speeds if weight is watched.

THERE are two things which remained unanswered in the general lexicon of published wisdom on things boatwise.

One unanswered question is, "Will a converted motorcycle or auto engine drive a boat with an air prop?"

The second unanswered question is "How can I get reasonable speed on a boat that will float on a morning dew?"

Whizzer is the answer to all of this.

She's little, and light, and easy to build in the bargain. And inexpensive.

Further, she will go reasonably fast with a light converted motorcycle engine which has enough intestines to produce 25 h. p. on a weight of around 85 lbs. About 22-23 m.p.h.

Use Water Rudder

And she draws as little water as is reasonable. I'd like to leave that rudder off, so that there would be nothing on the bottom but paint, but I can't perpetrate anything on the public that won't work, so I'm telling you that air rudders are lousy—a bane on the stern end, if you get what I mean. Not only are they affected by every cross wind that blows, but they haven't any turning power at low speeds. On airplanes they are O. K. as there is enough wind to make them effective. On a boat to do the same work they have to be as big as a barn. So water rudder we have, with its effectiveness and raft.

The first thing to do to build the boat is to order materials. The bill of materials is made up according to the material available in your locality. Mahogany side planking has been specified rather than plywood as plywood will crack and peel in water, no matter how much advertising is used to glue the plies together. Most anybody who can handle a foot rule can work out the necessary footage by taking his areas and lengths. This is part of building and needn't be gone into here.

Lay the lines down full size on a smooth floor. Draw the profile as shown to the right from the lines drawing. Use the table of offsets, which reads in feet, inches and 8ths, for getting the measurements. There is nothing mysterious about a table of offsets. The name is used merely to designate a table of measurements which are set up in table form to avoid cluttering up the drawings with arrowheads and dimensions, thus making the drawing otherwise difficult to read.

Laying Out Avoids Errors

Lay out the base line first, then the water line, and draw in the verticals at the stations. Then take the heights along the vertical stations, mark out all the dots on the chine, and fair them up with a batten. It doesn't matter whether the dots are a little out of line. The idea of the laying out to full size is to take out the little errors which creep into any designer's work when working to a small scale. The object is to get a fair set of lines full size that you can go to and immediately get your dimensions from.

Next make the frames from the lines drawings. Then set them up, remembering to reduce the final dimensions enough to allow for the thickness of the planking.

Set the frames up on a good strong back

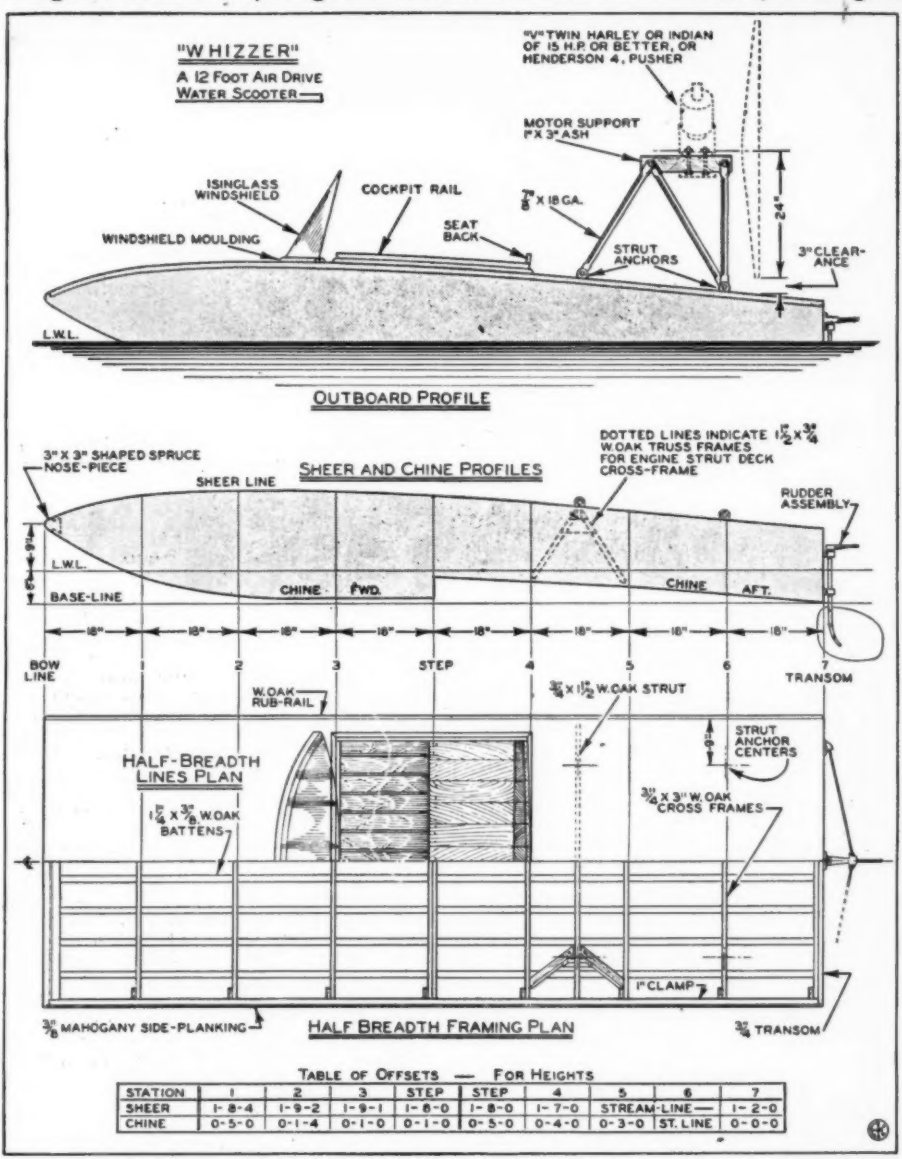


TABLE OF OFFSETS — FOR HEIGHTS

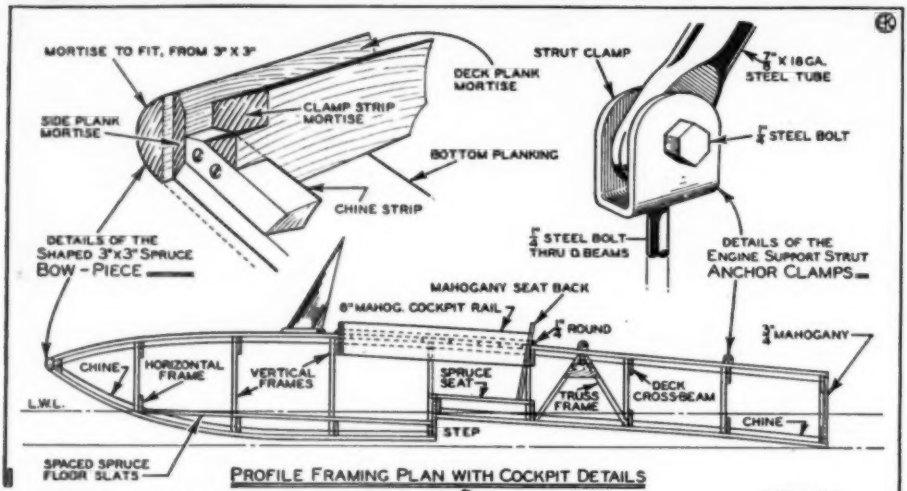
STATION	1	2	3	STEP	STEP	4	5	6	7
SHEER	1-8-4	1-9-2	1-9-1	1-8-0	1-8-0	1-7-0	STREAM-LINE—		1-2-0
CHINE	0-5-0	0-1-4	0-1-0	0-1-0	0-5-0	0-4-0	0-3-0	ST. LINE	0-0-0

Here are the hull lines drawings and motor mounting details for Whizzer. The forward side truss frames are clearly indicated. The motor mount shown will hold fifty h.p. and 100 lbs. weight. Heavy pitch low diameter props must be used. Offset table gives measurements in feet, inches and eighths above base line. Use this in laying out the lines.

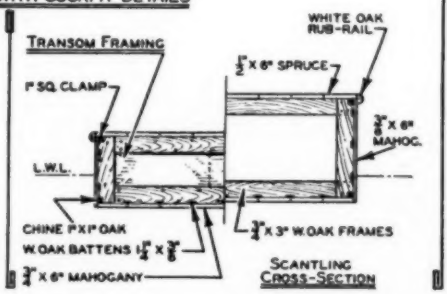
horse made out of inch lumber for the function, and lines them up so that the chines and the clamps will bend around airply according to the lines drawing. Then set in the battens which are shown in the cross section shown on page 132.

You are now ready to plank. Since *Whizzer* is such a little boat, I used ¾" planking on the bottom to give strength. This is heavy, I know, but as we have at least 25 horses and light motor weight this will not materially affect the performance, as the weight the extra thickness adds is more than offset by sturdiness. If the bottom

Scantling Details and Motor Mount Are Shown for Air-drive "Whizzer"



PROFILE FRAMING PLAN WITH COCKPIT DETAILS



SCANTLING CROSS-SECTION

The framing plan is shown in profile immediately above. It is important that the weight of the hull be kept down, or planing will be difficult. The two details next above show how the bow piece is cut and the anchor clamps for the motor mount made. Scantling cross sections to the lower right show how the battens are spaced and what the sizes are for the frames and the planking.

planking is coated with boiling hot linseed oil to minimize water soakage it will be adequate.

No steam will be needed to plank the boat. Use ¾" No. 7 brass screws spaced about 4" for all fastenings in planking on topsides and deck. The bottom should have 1¼" same number and fastened about the same centers.

Details of the rigging and motor mount are obvious from the drawings.

Now a word about these air drive boats, and all hydroplanes in general.

Remember that if you have a 20 mile wind to face, you are going to be cut down proportionately in forward speed when running into it. And when running before it you will gain proportionately.

Hull Handles Differently

Running one of these craft will require some of the feel of ordinary runabout running plus some of the feel for weather and wind that a sailor or a pilot always has.

As to the prop. This should, for the ordinary V twin, be of small diameter and relatively great pitch to keep the weight down low. This is *highly important*, and is one reason why no auto engine will work in this little craft.

I suggest a prop of 4 to 4½ foot dia. by 4 to 5 foot pitch. If the motor winds up too much you will have to add an extra blade or two to keep the revs down and to get the right amount of work out of the thing. All data on marine propellers (air drive for marine work) is largely empirical and will have to be determined by the method of cut-and-try. Anyhow, here is a starter, and you can rest assured that the hull will do its part if you get a good motor and mount it right.

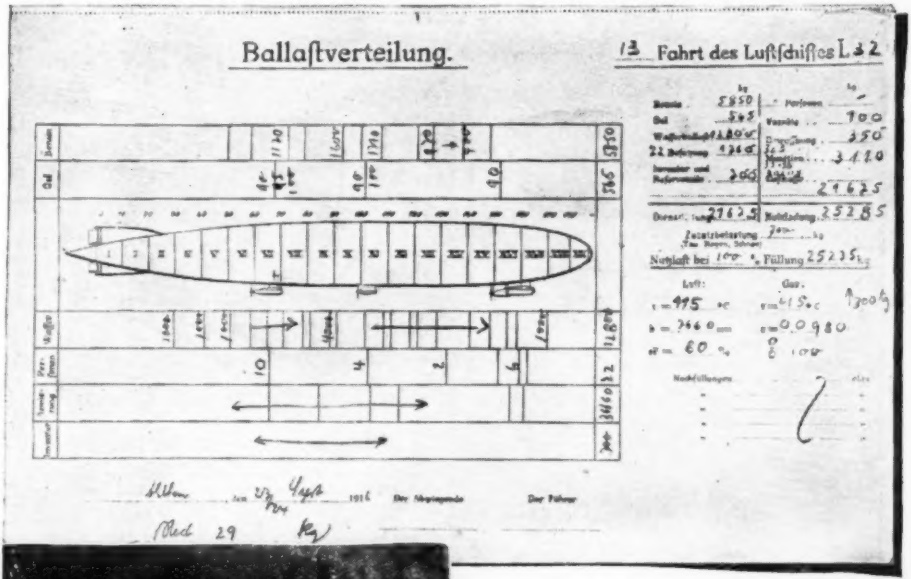
Some have asked me how to build an airplane propeller and how to calculate pitch.

We have in preparation an article which will show all there is to know about the making of the propellers, and also a little technical dope which will show you how to figure empirically the approximate propeller for any given job. Until that time, and the article will not be long in the cooking, I suggest that if you want to build Whizzer that you secure a set of blueprints, as they show things larger than can be done in M-M because of reduction in cuts.

Blueprints for "Whizzer"

Shop blueprints, containing no more information than the drawings appearing with this article, but done up in large-size form so that the job of taking off dimensions and laying out the lines is simplified, can be obtained for 50 cents, postpaid, from the Blueprint Department, Modern Mechanics and Inventions, 529 S. Seventh St., Minneapolis.

Book Might Have Changed War Course



The charred book whose cover is shown at the left was salvaged from a Zeppelin shot down over London, but has just come to light. Important information on ballast disposition, contained on page reproduced above, would have simplified the problem of Zeppelin attack had it been available to the Allied air force during the World war.

THE charred book shown in the photo above might conceivably have altered the course of the World War, enabling the Allies to win more quickly than they did, had the entire history of its discovery been less amazing.

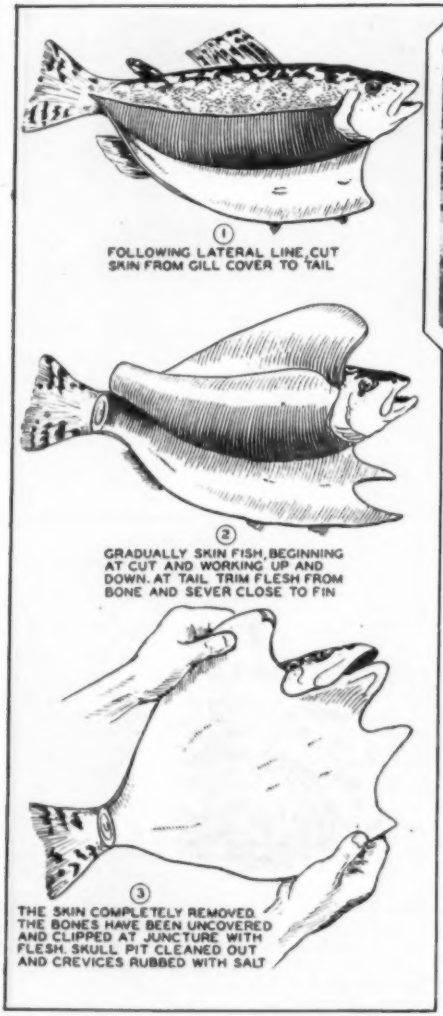
It was salvaged by an English country squire from the wreckage of a Zeppelin shot down in his front yard. Ignorant of its vital importance, the Englishman put the book away in a drawer as a souvenir, and it did not come to light until his recent death. It now rests in the British war museum.

Its importance lies in the fact that it contained complete information on the disposition of ballast inside a Zeppelin, showing just how much weight was distributed in each "bay" or section of the ship. It also set forth clearly the amount of armament carried and details of construction which would have made the task of bringing down a Zeppelin much easier by picking out its vital spots.

Lives lost in the destruction of the British airship R-101, which was wrecked a year ago, might have been saved if the ballast information contained in this book had been available to English engineers during its construction. This is the view of an official of the British Air Ministry, who admits the possibility that calculations might have erred on the difficult point of ballast.

The book was carried from the Zeppelin L-32 by a member of the crew who collapsed before the English squire's door after fleeing the flaming wreckage.

Mounting YOUR Prize


1
FOLLOWING LATERAL LINE, CUT SKIN FROM GILL COVER TO TAIL
2
GRADUALLY SKIN FISH, BEGINNING AT CUT AND WORKING UP AND DOWN. AT TAIL TRIM FLESH FROM BONE AND SEVER CLOSE TO FIN
3
THE SKIN COMPLETELY REMOVED. THE BONES HAVE BEEN UNCOVERED AND CLIPPED AT JUNCTURE WITH FLESH. SKULL PIT CLEANED OUT AND CREVICES RUBBED WITH SALT

Remove the skin from the fish by following steps 1 to 3 illustrated above. Exercise great care in handling the skin lest you knock off scales or otherwise mar the surface.

EVERY year a great number of large, perfect fish could be saved and mounted if the angler were aware of the simple directions necessary for preserving a specimen. It is not the intricate process that many people would believe it to be. There are certain rules to observe, some precautions to abide by, but these are not beyond the abilities of the average fisherman.

As stated, not all fish that are annually taken by the sportsmen can be shipped out intact. The skin, however, can be removed from a fish and can be immersed in a five per cent solution of formalin, which contains one part of formaldehyde to twenty parts of water. In the absence of this commercial preparation it is possible to preserve the skin of the fish in a strong brine solution, thereby keeping it in condition.

Body of fish should be kept wet during the skinning process. This is best achieved by having an assistant sprinkle on water with a can while you are performing operation, as illustrated here. Fish is laid on a wet cloth, with a sheet of canvas or similar material underneath.

Proper Care of Fish's Skin

The receptacle in which the skin is submerged should not be too small, as it is not good policy to fold the skin too many times. It should, however, be kept wet and should never be permitted to dry at any one place from the time it is placed in the solution until you are ready to mount it.

Let us assume that you are in the woods and that you intend to skin out a fish that you have taken. We will say that it is a brook trout. It often happens that one side of a fish will be more flawless than the other side. This unmarred side therefore should face outward, while the less perfect side goes against the side of the panel.

Keep Fish Wet While Skinning

The fish when being skinned should be placed on a flat surface, preferably on a piece of canvas stretched out on the sand. A wet cloth, let us say a towel, is placed under the fish to prevent rubbing the side of the fish and knocking off any of the scales as you remove its skin. The fish should constantly be kept wet, a second person sprinkling water on the fish while you work.

Proceed then as shown in Fig. 1, making your cut from the tail to the gill cover, following the so-called lateral line present in all fish. A sharp-bladed pen knife is best for the job.

CATCH *is an* EASY JOB

When you have made your initial cut from tail to gill cover, gradually skin the fish, beginning about at the middle and working up and down, pushing your forefinger under the skin to all sides as illustrated in Fig. 2.

The flesh of the abdominal walls will show a tendency to break and go with the skin, hence a little care is needed in removal at that point. Arriving in the neighborhood of the tail great care should again be taken. Work the skin to both sides, then trim away the flesh from the bone and sever it close to the fin.

When you have contrived this your work will be approximate to that shown in Fig. 2.

The fish is now turned, flesh side down and flawless skin side up. Care must be taken here also in working around the fins so as not to split or tear the skin at these points. The bones should be uncovered and clipped at the juncture with the flesh.

Working carefully you will eventually bring the skin down to the head just back of the skull. The flesh is now pared away, the backbone uncovered and severed close to the skull. While you are doing all of these things keep the skin wet and avoid pressure against it, which is likely to break up the scales in patches.

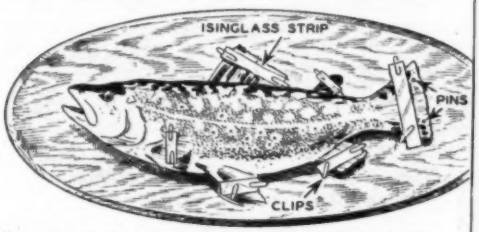
Having removed the entire body you next remove the tongue of the fish and then its gills. Then the eyes and the brains follow. Clean out the skull pit thoroughly and rub salt into the skull and all crevices.

Your fish skin when now held out should look very much like Fig. 3. The skin is now gone over carefully and any flesh adhering to it is carefully scraped away. Unless the skin is perfectly smooth there will be lumps or blemishes on it when stretched over the wooden form.

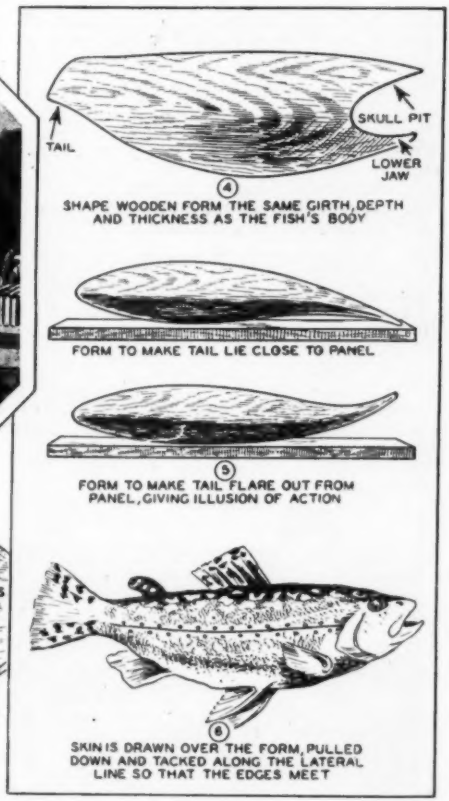
The skin is now submerged in the formalin solution or in the brine water and

(Continued on page 192)

With that whopper of a fish mounted and hung up in your den, no one can doubt your stories. A simple wave of the hand will substantiate the dimensional data.

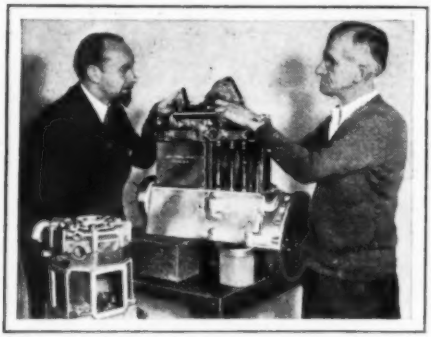


Here is how the fish appears mounted on an oval oak board. Fins must be trained to lie in position with isinglass strips, which are secured with clips on the ends as illustrated. Pins run through the fins will hold them in a life-like position. Attach the fish to wood oval by means of screws through the latter into the wood of the fish form. Final task is then to paint fish in its natural colors, taken from notes made after the catch. A coat of varnish will do duty as preservative.


TAIL
SKULL PIT
LOWER JAW
4
SHAPE WOODEN FORM THE SAME GIRTH, DEPTH AND THICKNESS AS THE FISH'S BODY
FORM TO MAKE TAIL LIE CLOSE TO PANEL
5
FORM TO MAKE TAIL FLARE OUT FROM PANEL, GIVING ILLUSION OF ACTION
6
SKIN IS DRAWN OVER THE FORM, PULLED DOWN AND TACKED ALONG THE LATERAL LINE SO THAT THE EDGES MEET

After you've caught the fish, take girth, length, and thickness dimensions, then follow them in shaping wooden mounting form, shown above. At bottom is skin-covered form.

New Motor For Submarines Uses Compressed Air as Fuel



Only fuel used in this submarine motor is compressed air which is heated electrically and fed into the motor from supplementary generator. 500 pounds pressure is used.

UNCLE SAM won't need any fueling stations for his submarines when they are equipped with the new compressed air motors recently developed for underwater boats. The motor runs solely on air and uses no other fuel.

A tank of air under 500 pounds pressure is sufficient to run the motor for several hours. The air is electrically heated in a generator attached to the motor, which increases its pressure still further. Air can be pumped back into the tank and used repeatedly.

Roy J. Meyers, of Los Angeles, who recently invented an air-powered automobile, is shown at the left explaining his motor to Sir Hubert Wilkins, famous explorer.

Chemical Combats Narcotic Habit

THE end of the horrors of narcotic and alcohol addiction is forecast with the announcement from Cornell University that successful experiments have been completed with a chemical compound that combats the effects of drugs on the nerve system.

It was found that habit-forming drugs and alcohol leave the sensory nerves in an irritated state, causing a craving for more, and this irritation results in protein coagulation.

This condition of the nerves is reversible by the new compound which restores nerves to normal condition.

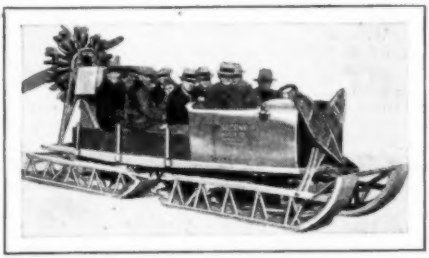
Duplicating Machine Run by Hand

RETAIL merchants' demands for a duplicating machine of simple design, easy operation and quality reproduction, have been answered in the invention of the "Jiffiprint".

The new machine embodies the same principles as other duplicating devices and is designed like a roller blotter. The stencil can be filled in either by hand or on a typewriter, and drawings or illustrations sketched or traced in with special pencils supplied with outfit. Machine inks automatically.

Duplicate copies are made with the "Jiffiprint" by fastening stencil over ink pad and pressing on paper as shown.

Aero-Sled Travels Over Deep Snow



Driven by a 450-horsepower airplane motor, this aero-sled brings aid to snow-bound victims in sub-zero weather.

SUB-ZERO weather and thirteen foot snow drifts don't stop this aero-sled, which has been pronounced unexcelled as life-saving and relief equipment for snow-bound victims.

Driven by a 450 h.p. airplane motor, the aero-sled recently succeeded in breaking through thirteen feet of snow in the high Sierras, carrying 2½ tons of food to snow-bound victims.

Brush Knife Made From Saw Blade

A COMBINED brush knife and saw for cutting brush and heavy growths of weeds can be made by mounting the blade of an old hand saw as shown at the right.

With a cold chisel, punch holes through the lower end of the steel blade. The handle can be mounted by using the original handle screws of the saw.

Sharpen the back edge of the saw to a knife edge and you have a handy brush machete.

Saw blade is sharpened and screwed to hard wood handle.

Amateur Electrician

Edited by SEWELL LEHMAN

Lighter for Pipe-Smoker's Convenience

THE pipe smoker will appreciate this lighter as it can be conveniently screwed into any standard light socket and will light as little as a half-pipeful of tobacco.

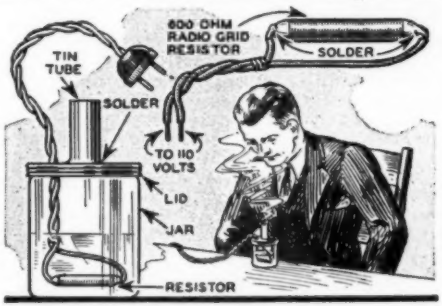
The base is a burned-out fuse plug with one-inch wire connections attached. Mix a little plaster of Paris with a half-and-half solution of water and sodium silicate (water glass) and fill the plug, from which the mica has been removed.

Also fill a small wax-paper cone with the plaster and place it on the plug to harden. The center connection wire should pass up through the cone and out at the tip.

A spiral channel should be gouged into the cone while the plaster is still "green." The heating element is from an electric cigar lighter. After fitting it into the channel clamp the ends to the wire connections and the lighter is ready for use. A piece of mica, perforated and shaped into a cone, may be fastened over the coil, but impairs its efficiency somewhat.

Heating element of the electric pipe lighter should be wound around plaster of Paris form, which is gouged with groove as shown. Note how heater is placed in pipe.

Electric Cold Medicant Vaporizer



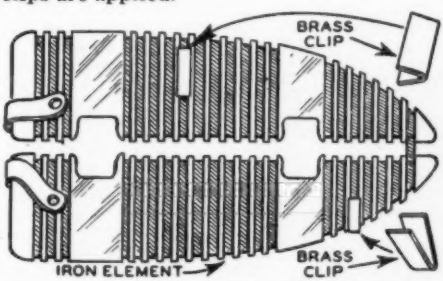
Parts for the vaporizer are assembled as shown above. Heat of the resistor creates fumes, which pass out the tin tube.

A SURE way to break a cold is to breathe in the fumes from this simple little vaporizer. An ordinary cold medicine jar and lid will serve as the container, while a 600 ohm grid resistor takes the part of the heating element.

Wires from a 110-volt circuit are soldered to the end of the resistor, which is put into the bottom of the container, as illustrated in the accompanying drawing. For delivery of the fumes, a small ½-inch hole is cut in the lid to take a small tin cylinder. The heat generated by the resistance will vaporize the medicine, and fumes will rise from tube.

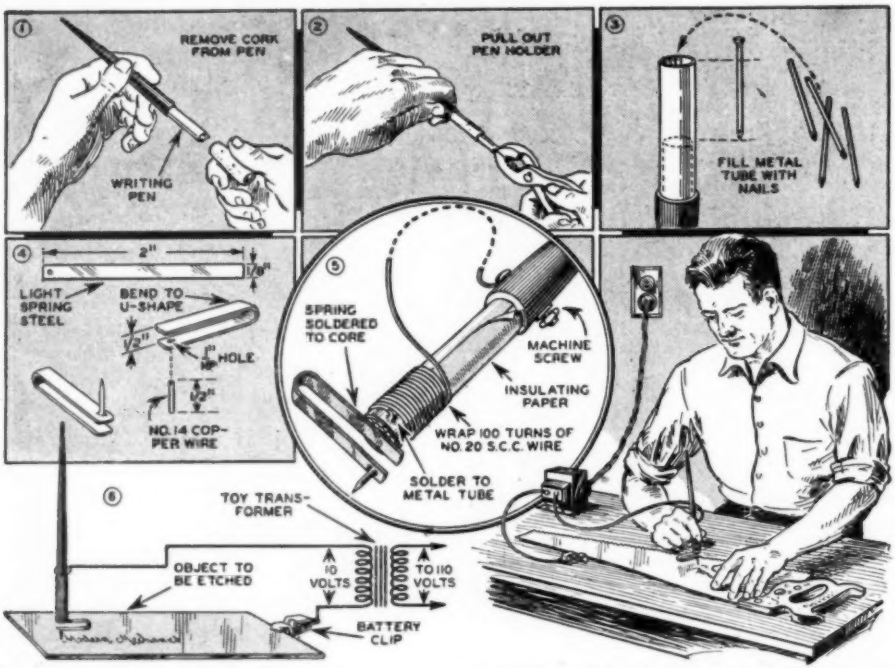
How to Repair Your Electric Iron

BURNT out heating elements of an electric iron may be quickly repaired by use of a small brass clip, as illustrated below. If the break occurs at the edge of the element the clip should be clamped over the edge to shunt out the broken section. If disconnection occurs between edges, set the clamp on the surface as illustrated. The ends of the ribbon should always be cleaned before the clips are applied.



For repair, clamp the brass clips in positions shown above.

Mark Tools with this Electric Etcher



Drawings from 1 to 6 above illustrate steps in construction of etcher. Metal tube is filled with nails to form magnet core, while U-shaped watch spring forms vibrator. Juice from a toy transformer will suffice to make clean-cut letters on tools.

AN ELECTRIC etcher is an exceedingly simple device, and any amateur workman should be able to make one. It enables one to etch permanently upon the metal parts of his tools, not only his name, but also the sizes or numbers of such tools as drills, taps, dies and wrenches.

Progressive steps of construction are shown in the drawings above.

First obtain a penholder with a cork or rubber end. Remove this cork or rubber and also the springy piece of metal which originally was intended to hold the pen point.

To form a core for what will be an electro-magnet, fill the metal tube with thin iron nails, cut to protrude slightly from the end of the cylinder. Insert enough so that they will be wedged permanently in place.

Watch Spring Makes Vibrator

Now obtain a piece of light spring steel (a watch spring will do) about an eighth of an inch wide and carefully bend it into a "U" shape so that the ends are about half an inch apart. Heat one of the ends and drill with a 1/16" drill. Then solder about half an inch of No. 14 copper wire in this hole and file the end to a point. Solder the other end to the end of the nail core.

To make the magnet winding first solder one end of a piece of No. 20 insulated copper wire to the lower end of the metal tube. Then wrap a strip of paper around the tube for insulation and wind 100 turns of the wire upon it. Terminate the other end under a machine screw located just above the metal tube. This completes the metal etcher.

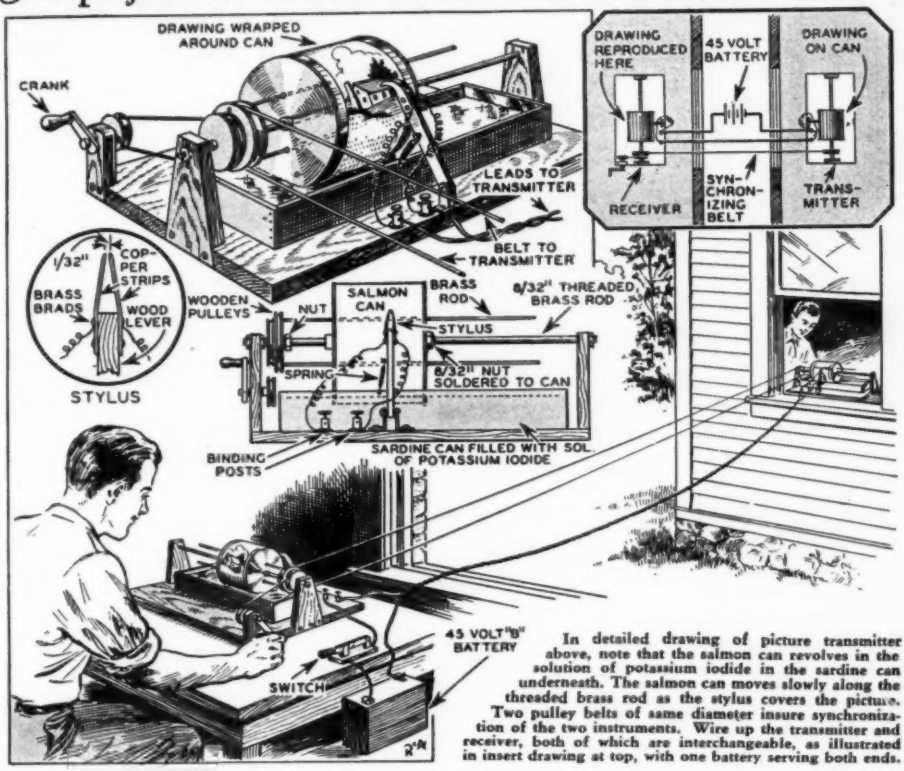
Operation of the Etcher

In operation, one of the wires coming from a toy transformer, which should supply about 10 volts, is connected to the machine screw on the etcher and the other is connected to the object to be etched by means of a clip.

The current flowing through the coil forms an electromagnet which attracts the steel spring, breaking the circuit. When the circuit is broken the spring is released and, the copper point again coming in contact with the metal object, the circuit is again completed and the operation is repeated.

This occurs so rapidly that the electric spark formed at the contact of the object to be etched and the copper point is practically constant. It is this spark that melts enough of the surface metal of the object to produce a clear and permanent "etching". After a short period of operation you may have to file the copper wire to a new point.

Simplified ELECTRIC Picture Transmitter



In detailed drawing of picture transmitter above, note that the salmon can revolves in the solution of potassium iodide in the sardine can underneath. The salmon can moves slowly along the threaded brass rod as the stylus covers the picture. Two pulley belts of same diameter insure synchronization of the two instruments. Wire up the transmitter and receiver, both of which are interchangeable, as illustrated in insert drawing at top, with one battery serving both ends.

A COUPLE of sardine and salmon cans, a few bits of brass and several pieces of wood are all the materials that are needed to assemble an experimental but very practical picture transmitter and receiver.

Two of each of the cans will be needed. The salmon cans should be of the small or half can size and the end that has been opened should be replaced by soldering in water tight, a new disc of tin.

Two center holes are drilled, one in each end of the salmon can and over one hole a brass 8-32 nut is placed by soldering. This is to guide the can over the threaded brass rod as illustrated. This threaded brass rod is secured to the wooden pulley wheel which turns the cans.

The sardine can is mounted to the baseboard by punching two holes in the bottom and driving in two short wood screws, which are soldered around the edges to prevent leakage. A bit of molten wax, poured in will eliminate danger of rust.

Stylus Made From Copper Strips

Now for the stylus. This is formed by two copper pieces cut as illustrated in the inset sketch above. They are held to the wooden arm by small brass brads. Wires are soldered to each of the stylus members and carried to binding posts mounted on the base.

The wooden pulleys used should each be of exactly the same diameter, otherwise it will be impossible to operate the stations in synchronism, which is imperative. Two of these devices will be needed, each serving as a combination transmitter and receiver.

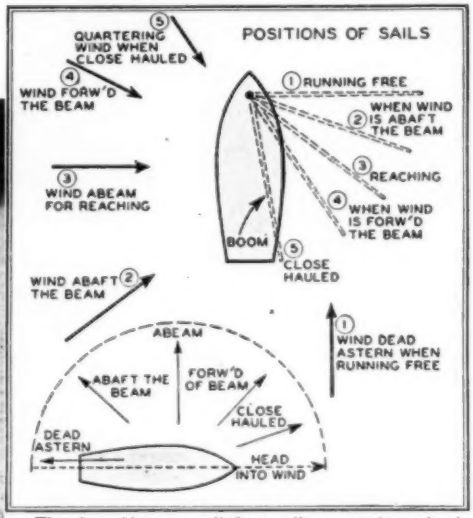
Operation of the Transmitter

Operation of the instruments is surprisingly simple. Upon the stylus of the transmitter there is placed the picture to be transmitted. This is drawn with a very soft pencil. The stylus of the transmitter plays over the entire drawing as the can is revolved along the rod.

As each line of the drawing passes under the stylus, the carbon will form a conducting medium between the stylus members and a small current will flow.

At the receiver, a similar stylus is playing over the surface of a piece of paper that has been wetted with a solution of potassium iodide. When the current flows, decomposition of the solution will take place and a brown line will be left on the paper, forming the same picture as that at the transmitter.

The A-B-C of SMALL



The first thing a small boat sailor must learn is the terminology of things sailorwise. Above is an illustrated glossary showing the position of the wind and its relation to the position of the boat and sail. Memorize these conditions if you have never sailed a boat. Then this article will be easily understood. Off to port here (left) is a boat shown sailing close hauled into a light quartering breeze.

EACH summer brings its own casualty list from overturned sailing boats. Much of this is due to ignorance of sailing technique, rash and foolhardy handling or pure inexperience.

The natural laws governing the handling of small sailing craft are few and easily learned. Experience in the use of proper methods is of course necessary to make one a sailor, but anyone with average brains can quickly learn the essentials and then put them to good use.

When I say "small boat sailing" I am speaking of the real small boat such as a sailing skiff, dory, canoe; in fact, any boat capable of being propelled by sail and not over 18 feet long. Thus I can confine myself to craft using but one sail, such as the leg-o'-mutton, lateen, gaff and boom, and other common rigs used on small boats.

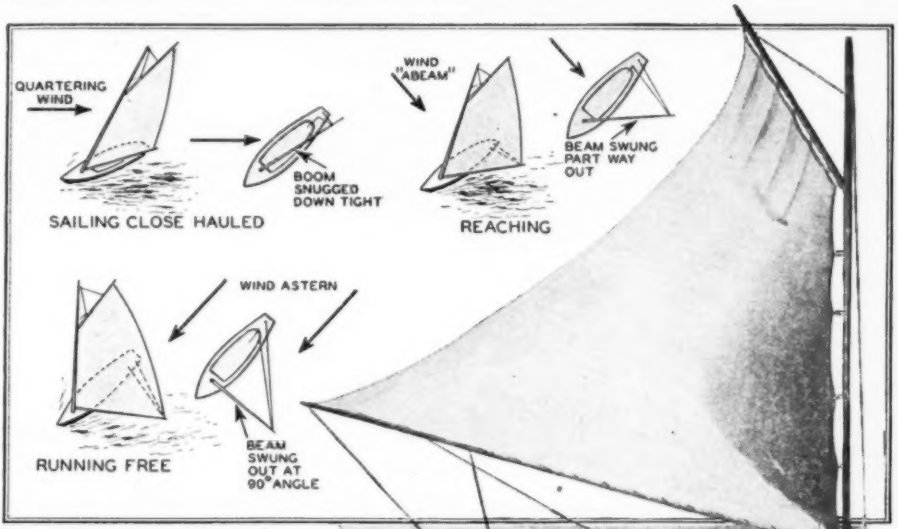
While the essentials of sailing are the same for the five-masted schooner as for the sailing canoe, the details are of course much more complicated. So single-canvased job it will be, and let's hope you will grab the main sheet with more confidence when once you grasp the A-B-C's of sailing.

First, sailing a boat means allowing the wind to strike the sail so as to push the hull forward. Thus the direction of the wind and the angle of the sail have to be considered. A sail has about a 90° arc in which to swing, while the wind can be coming from any direction within an arc of approximately 160°. One might think that it would be 180°, but remember that a direct head-

When airs are light it is permissible to "gybe" around when coming about on the opposite tack. In this photograph boats are shown gybing—turning stern first to the wind and letting the wind fill out the slacked sail from astern.

BOAT SAILING

by THORNTON HALLETT

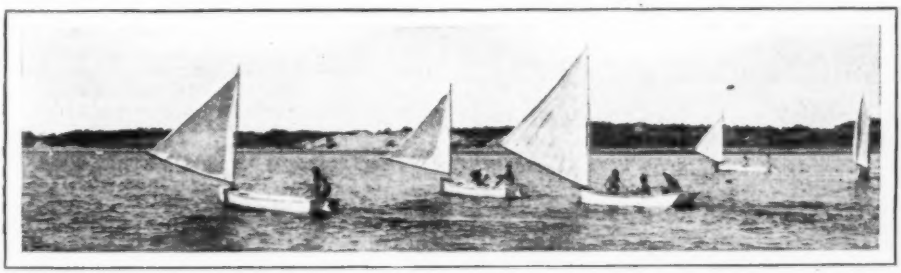


Off to starboard here (right) is shown a sharpie with a loose footed cat rig. Her mainsheet (boom trimming rope) has been slacked off so that the sail is in the right position for reaching. The light wind is abeam. Unless some objective can be more quickly reached under this condition, most sailors would slack off still more and run free as shown above in the diagram.

wind will not fill the sail and this is necessary to exert pressure upon it. Therefore the arc must be somewhat reduced.

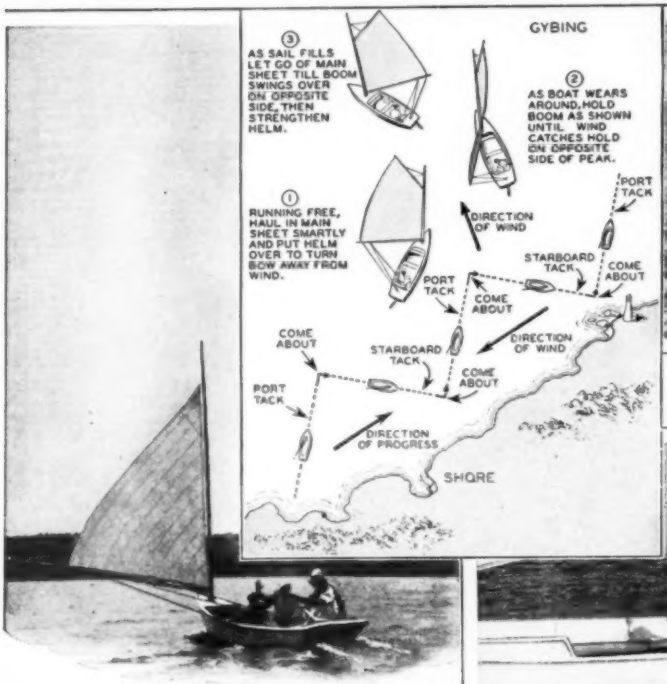
Study the first sketch. This shows the various positions of the "boom" or bottom of the sail for different phases of sailing. At right angles to the hull (No. 1) the sail is properly trimmed to catch the full force of a stern wind or one slightly abeam. This is called "running free". Now at position No. 3 the sail is hauled in about half way, or at about 45° to the line of the keel. In this position a direct beam wind will be most effective and sailing thus is called "reaching".

At position No. 5 the sail is in to what is known as close hauled. That is, the sail is trimmed as flat as possible and still have the boat make headway. In this position a wind striking the boat to within 20° to 25° off the bow will fill the sail to full driving capacity. With the bow pointing closer to this into the wind the sail will be liable to "spill" the wind and lose headway.



Running free. With the wind directly astern the mainsheet (boom trimming rope) is let out so the boom is at right angles to the center line of the hull as shown in this photo. Under some conditions this gives greatest speed.

"Gybing," or Coming-about With Wind Astern Is an Easy Maneuver


GYBING
3 AS SAIL FILLS LET GO OF MAIN SHEET TILL BOOM SWINGS OVER ON OPPOSITE SIDE, THEN STRENGTHEN HELM.
2 AS BOAT WEARS AROUND, HOLD BOOM AS SHOWN UNTIL WIND CATCHES HOLD ON OPPOSITE SIDE OF PEAK.
1 RUNNING FREE, HAUL IN MAIN SHEET SMARTLY AND PUT HELM OVER TO TURN BOW AWAY FROM WIND.
DIRECTION OF WIND
PORT TACK
STARBOARD TACK
COME ABOUT
DIRECTION OF PROGRESS
SHORE

Sloop (jib and mainsail) sailing close hauled on quartering wind.

This view directly above gives you a clear idea of how the tiller and mainsheet are arranged for easy handling. Holding the mainsheet directly in the hand is very tiring, so one or two tackles are used. Above, in diagram, is explained 1-2-3 mechanics of gybing, which can be done in light winds.

Above is a small cat rigged boat (main sail only) reefed down and running free. In the diagram above is also explained the method of traveling from point to point by tacking; that is, running angularly to the wind in one way for a while, and then averaging one's distance back again by running to the wind on the other tack.

This is the usual position assumed when "tacking". Position No. 2 of the sail is used when the wind is "abaft the beam" or, in other words, when it blows from a direction between directly abeam and directly astern. And when in position No. 4 it meets a compromise wind lying between that met in sailing close hauled and a beam wind employed in reaching. All positions of the sail between these major five positions are met by the skipper as he feels the direction of the wind shift or when it is blowing too stiff.

Of course, this example assumes that the wind is blowing from as many different directions with the boat making the same course. In actual practice it is the wind that holds the same direction and the boat's course that is altered to it. That presents the problem of trimming the sail's position to meet it. A companion diagram B illustrates the various angles of the *wind's* direction in which a boat may be maneuvered by altering the sail's trim.

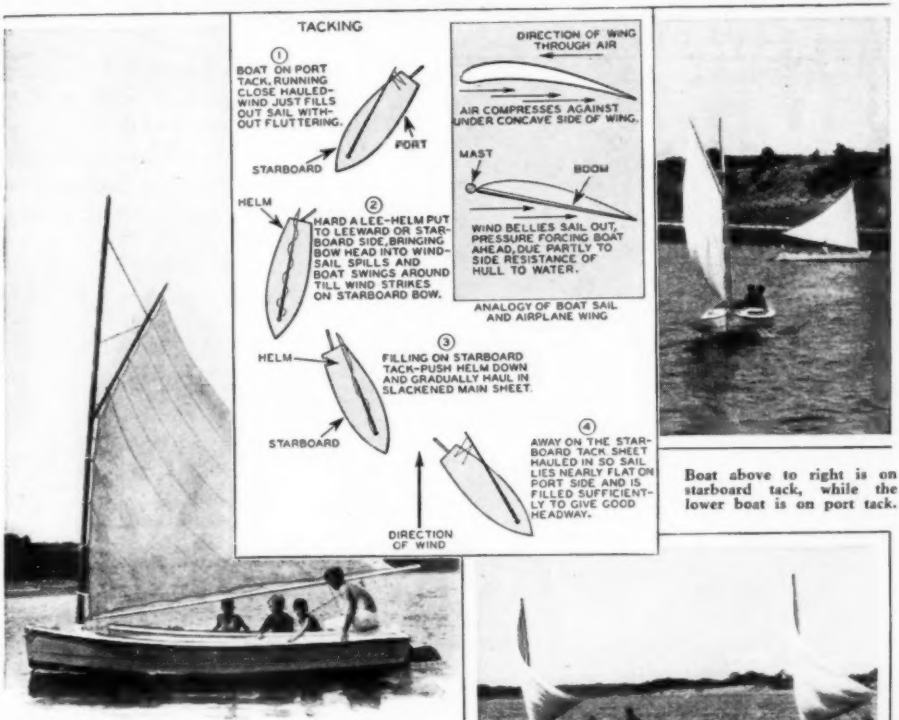
Look at the sketches on page 137 of boats in actual running position in relation to the three major directions of the wind to them. In one the sail is shown trimmed flat for running close hauled. Note here that the wind strikes just off the bow and will just fill the sail.

By studying the diagram on page 139 you will see how closely related a boat's sail is in this position to the wind of an airplane with respect to wind pressure. With the sail, the wind bellies it outward yet slips along its surface to spill out at the rear or "leech". A lessening of pressure occurs on the lee side of the sail. This acts similarly on an airplane's wing. The pressure of the wind created by the forward movement of the plane supports the plane in the air, the partial vacuum above the wing adding to its effect.

With the boat, however, the work done on the sail drives it into the wind, which of course carries the hull with it due to the flexibility of the water in which it floats and the actual design of the hull for ease of movement.

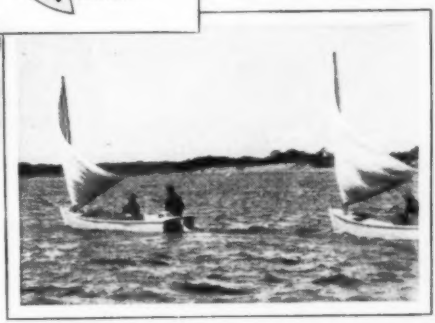
In another diagram the boat is shown reaching. Here the wind coming off the boat's beam must strike the sail at an angle

"Tacking" Is No Mystery; Diagram Below Explains Sailing Mechanics


TACKING
1
BOAT ON PORT TACK, RUNNING CLOSE HAULED-WIND JUST FILLS OUT SAIL WITHOUT FLUTTERING.
STARBOARD
PORT
HELM
2
HARD A LEE-HELM PUT TO LEEWARD OR STARBOARD SIDE, BRINGING BOW HEAD INTO WIND-SAIL SPILLS AND BOAT SWINGS AROUND TILL WIND STRIKES ON STARBOARD BOW.
DIRECTION OF WING THROUGH AIR
AIR COMPRESSES AGAINST UNDER CONCAVE SIDE OF WING.
MAST
BOOM
WIND BELLIES SAIL OUT, PRESSURE FORCING BOAT AHEAD, DUE PARTLY TO SIDE RESISTANCE OF HULL TO WATER.
ANALOGY OF BOAT SAIL AND AIRPLANE WING
HELM
3
FILLING ON STARBOARD TACK-PUSH HELM DOWN AND GRADUALLY HAUL IN SLACKENED MAIN SHEET.
STARBOARD
4
AWAY ON THE STARBOARD TACK. SHEET HAULED IN SO SAIL LIES NEARLY FLAT ON PORT SIDE AND IS FILLED SUFFICIENTLY TO GIVE GOOD HEADWAY.
DIRECTION OF WIND

Above view shows cat rig on a sharpie (flat bottomed) hull. Unballasted boats can well carry a crew of lively youngsters to act as ballast. In diagram is shown the steps which must be taken in tacking. Under average conditions and in strong winds this is the maneuver used to bring a boat from one tack to another. It is safest way of coming about.

Boat above to right is on starboard tack, while the lower boat is on port tack.



A good picture of two boats reaching, with the wind abeam. The upper right diagram shows how the sail of a boat can, at an angle, drive a boat through the water. Plenty of keel must be used to prevent drifting of the hull.

so the boom is eased off as shown. If eased off too much, the wind will again spill and the craft lose headway, while if kept in too flat the wind pressure will be too evident against its surface. This might capsize the craft in a stiff breeze, or at any rate there will be little wind slip and the boat will lag in its course and not make the speed it should.

When running free you are taking full advantage of the wind's force and so allow the boom to swing wide and catch the force of the breeze. Here the wind *should* strike as near full on the sail as possible because the boat's natural direction is taken advantage of. Racing boats usually carry a secondary sail for this purpose known as the balloon jib or "ballooner," which is swung wide out on the opposite side, thus adding double sail spread. This is only carried when the wind is steady and directly astern, but adds considerable more speed so necessary in racing.

We come now to tacking, the prime method used in making headway into the teeth of the wind. Without tacking the sailor could only sail directly across the wind or with it. Tacking means to take a zig-zag course, first sailing close hauled with the wind on one side and then putting down the helm, turning into the wind and around just enough to catch the wind on the other side of the sail. The sail is again flattened and sailing continued close hauled, but with the wind striking the sail on the opposite side. Thus by a series of such zig-zag "legs" progress is made into the direction from which the wind is blowing. Good work can only be done with a boat possessing a good keel or center-board which will prevent the boat from slipping sideways in the water.

Study diagram on this page for the evolutions made in "coming about" from one tack to the other. First remember the nautical terms for right and left. The right side of a boat, facing forward, is called "star-

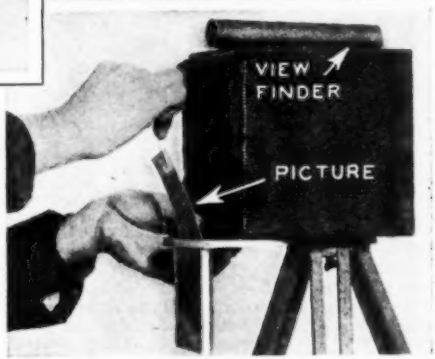
(Continued on page 186)

One-Minute Camera Makes

Here is the completed one-minute camera ready to go into action. Subject is brought into proper focus with the view finder mounted on top of the box as demonstrated above.

Here's a little knockabout camera that offers the last word in simplicity, economy and efficiency. Requiring only a few simple parts for construction, it will bring you a nice profit in pictures of visitors at parks and fairgrounds.

The negatives are loaded into the holder with the hands thrust through the black bag as shown here.



When negative has been exposed it is inserted in the developing tank, which is then revolved so that completed picture can be removed. Picture is developed one minute.

"YOUR pictures, lad-ies and gentlemun, made and finished in exactly one minute!"

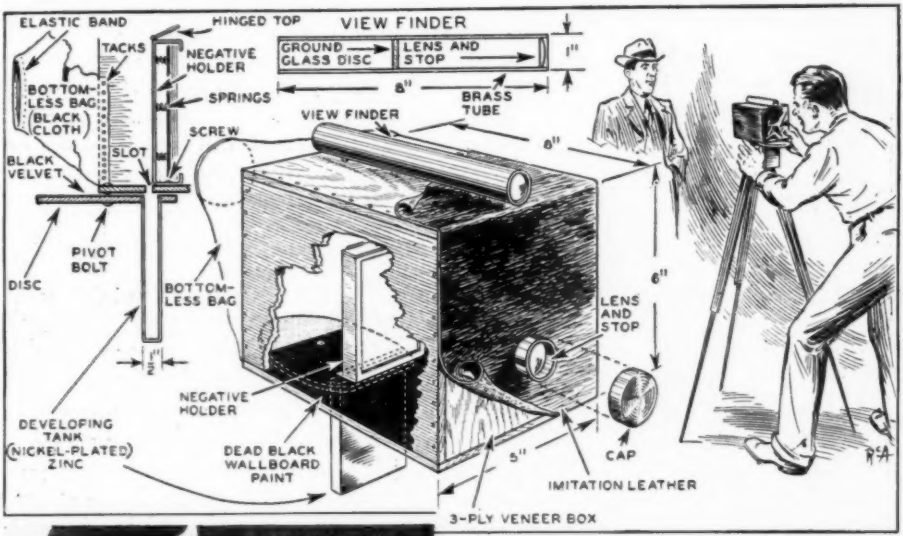
And in that length of time you have a good likeness of yourself for fifteen cents; also, for one minute of his time, the itinerant photographer has made a profit of about fourteen cents.

The camera is easily made in the workshop with some three-ply veneer, nickel-plated zinc from the plumbing store and parts from two old box cameras of the same size. An outlay for supplies consisting of direct-positive cards and a can of prepared developer—about a penny a picture—and you are equipped to make pictures of friends, babies, or merely snap away for your own amusement and at a minimum of expense.

First, on the old camera, measure exactly the distance from the lens surface to the plane on which the film travels, and observe this distance in installing parts in your one-minute camera. Then make the box. With lenses from 2¼x3¼-inch cameras the box will have dimensions in accompanying drawing. The back is left open. Following the drawing, drill a hole for the lens in one end and install it, together with the "stop." It is best installed inside a short metal tube, a part of the latter projecting outside to hold the lens "cap" which is merely a small metal lid, lined with velvet and fitting snugly the end of the tube.

At the correct distance behind the lens screw to the floor of the camera the "negative holder." As shown in the drawing, this is a metal box with the front cut out for making the exposures, a hinged top that snaps up so you can load it with negatives, and a set of springs inside to keep the negatives in the front of the box, or at the "focal plane," at all times.

Pictures that PAY PROFITS



Here are shown details of camera construction. Note how disc holding developing tank revolves under box. To make completely light-proof, the interior of the camera should be coated with dead black wall board paint. Finally cover entire box with layer of imitation leather as shown above.

Developing tank is held by a veneer disc which pivots under box of camera on bolt inserted in hole through center. Top of disc is covered with velvet to make light-proof.

Next comes the developing tank. This is a little larger than the cards and about a half inch thick, inside measurements. Make it of nickel-plated zinc, nickel inside the tank. Cut a slot to match the tank opening in a veneer disc and fasten the tank under it.

The disc is covered, on top, with black velvet to make it light-tight, and finally fastened to the underside of the box with a bolt, spring and washer.

Into the back of the camera, which has been left open, tack a bottomless bag of heavy black cloth. Gather the outer end of the bag and sew into it a length of elastic so that it will remain closed.

The view finder is made of a one-inch brass tube the length of the camera and installed directly in the middle on the top. At the front end place the other lens and stop; farther back, at the correct distance, a ground glass disc. These are best installed with metal sleeves fitting inside the tube.

In taking a picture fix the camera securely to a tripod or other solid surface. Holding a wrapped package of the paper negatives in the hand, insert it into the camera by means of the cloth sack. Unwrap the negatives and place them, a few at a time, inside the holder. This is done by pulling back the spring top and forcing the springs back while shoving the negatives down inside.

How to Snap Pictures

Next, turn the developing tank around on its disc until the slot is in the rear and fill it nearly to the top with developer. Return it so that the slot matches the slot in the bottom of the camera.

Now look through the viewfinder and see that the subject is nicely centered and in focus. The finder will show the subject's face, rather than a larger view, and you will know that everything is "set." With the right hand quickly remove and immediately replace the cap over the lens. This will allow a one second exposure, which is approximately correct.

Now again reach into the camera and remove the first negative from the holder. Drop it into the slot and into the developing tank and after a minute turn the disc so that the opening of the tank is available in the rear. With pincers remove the finished picture, rinse it in plain water for five seconds and hand it to the "customer."

Plans for the Pietenpol

Here we round the pylon on the home stretch in one of the most popular how-to-build stories we have ever published. This series on building the Sky Scout, slightly smaller sister to the Model A powered Air Camper, is second only in popularity to the series run on the building of that famous ship. Here are finishing details of motor conversion, operation, ship finishing and flying hints. Bank her over and rip in!

PART III—Engine and Finishing

FOR the benefit of the few airplane fans who did not follow the plans of the Sky Scout in the first two parts (April and May issues of MODERN MECHANICS AND INVENTIONS) let me summarize what we have gone over.

As you know if you read these first two parts, the Sky Scout is a slightly smaller version of the famous model "A" powered Air Camper which was published in this magazine about a year ago, and which is now obtainable in the Flying and Glider Manual, and in blueprint form.

Model T Ford Motor Used

The Sky Scout, however, instead of being a two seater, and using the 38-40 h. p. model A conversion, makes use of the cheaply obtainable model T motor, and is a one seater in which a student can pile up hours at low expense.

It is a ship for which an identification number can be had from the Dept. of Commerce, and while I have heard that a few over-zealous inspectors will ground a ship if it doesn't have a "C" of some kind, you will find that all state legislation hinges upon the Federal air laws, and that anyone can fly for himself on an unlicensed field in an unlicensed ship if he wishes. All that the states ask is that the Federal laws be observed and that unlicensed ships not be flown from licensed airports.

So much for our introduction.

Part one, in April, took up the building of the fuselage and the wings.

Part two, in May, explained the landing gear, tail surfaces, and control system.

Now, in part three, we will have a little word to say about the minor fittings, the finishing of the ship, and the method of fixing up what little conversion work there is to making the Model T a good airplane engine.

We will take the power plant first, as the whole ship is of course built for the motor it will be using.

This ship was built for the model T of course, but may I say that the cowling is big enough for the model A. There is not much difference in the sizes of these two motors, but you will need a new engine bearer if you use an A, and also put the wing about an inch ahead.

Model A Carburetor Favored

We did not make plans for the motor as every one has his own ideas on the subject.

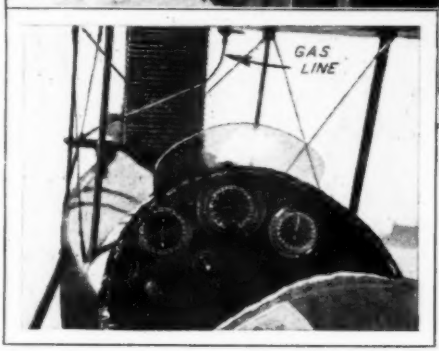
As long as they cool well and oil well they all work about the same in an airplane as in a car. The following changes were made. A model A carburetor was used. Cut off the intake flange where the carburetor was fastened and weld it back on so that a model A carburetor will fit. See drawing,

Exhaust stacks are put on. Aluminum pistons were installed. The regular head and valves were used (putting in larger valves won't help—the passages aren't big enough to let the gas flow any faster). The end of the camshaft was fixed for a tacho-

Always warm the ship up a little before taking off. See that the oil is warmed all through, and that the water and valves have warmed up. Some peelots have felt they were driving a car with these motors. Be sensible!—it pays to take pains!

SKY SCOUT

by B. H. PIETENPOL



The little Sky Scout is easy to service. Here we have one of Doug Rolfe's famous washes showing the scale appearance of men working on the motor. Check the works every time you put the ship up after flying, re-check before flying, and you'll never have motor trouble up aloft. To the left is shown how the gas line is drawn from the center section tank and run to the motor. Visibility is better than average. And look at the equipment—instruments—you can get cheaply to aid you in accurate, safe flying. Use 'em!

meter drive as was shown on the drawings in the Manual and prints for the A conversion. Be sure and put in a tachometer. They are very necessary and don't cost much.

A fellow had an Air Camper here this summer without any instruments in it. I flew it but sure did not like it that way. I say, the more instruments the better. We use a complete set on all our ships.

The magneto is driven in a left hand direction, direct from the crankshaft.

Better use a good mag, as I have seen a lot of the old D U 4's go bad when they are flown in hot weather. Also, a new mag weighs about 7½ lbs. where the old ones weighed about 14 lbs. Although we have one of the old mags on a ship at present, and it seems to work fine. The propeller hub is made as on the model A, except that it is necessary to use a nut on the engine side as the flange is not threaded.

We use a gear driven oil pump from an old Ace motor, built by Horace Kean in N. Y. about 1919. We have a hollow drilled shaft and carry three quarts of oil, although any good oil system will work. Don't favor splash so much for model T's as they have bent hair pins for crankshafts and the bearings are small, although the shafts are built of the best stuff money can buy for crankshafts.

Thermo-Syphon Cooling

The thermo syphon system is used. The block is fitted with a one and one-half inch outlet near the top front of the motor (see drawing) opposite the place where it was on the motor, and this runs to the radiator top. A circulating pump could be used in warm weather, and would be better, but we have had no trouble as on one instance Don Finke flew a ship from Spring Valley, Minn., where we have our shops, up to Minneapolis, a distance of 150 some odd bee line miles, and he ran into some hot, dry weather, then a thunder and rain storm. The motor never coughed, but kept slamming along.

The radiator was made from a 1926 Macord Ford radiator cut in two and one half put in back of the other. This makes

Sky Scout Performs Like Air Camper, Using a Converted "T" Ford

OUTLET HOSE TO RADIATOR
WATER CONNECTION
EXHAUST STACKS
VALVE EXHAUST VENT
INSTALL AIR PIPE TO CARBUR. FROM VALVE PLATE
NUTS
BOLTS THREADED INTO CRANK FLANGE WITH NUTS TO HOLD SPINDLE AND PLATE SOLID
PIPE TO TOP OF RADIATOR
1" X 18 GA. TUBE BRACE
FLYRING SOLDERED TO SHAFT
OIL DRAIN
NICKEL STEEL BOLT AFTER TIMING
SOFT LEATHER
MAG SHAFT
MAG BASE LINE
THREAD END OF MODEL "T" REAR AXLE WITH ARMS WELDED ON
DETAILS OF UNIVERSAL JOINT MAG. COUPLING
MAGNETO
MAGNETO BASE
WELD
CUT OFF FLANGE ON MODEL "A" CARBURETOR AND WELD AS SHOWN
RE-BUILT CRANKCASE
SIDE VIEW OF COMPLETE CONVERSION OF THE FORD "T" MOTOR
NOTE INSTALL ALUMINUM PISTONS
1" X 20 GA. TUBE
FASTENING CLIPS WELDED TO STACK 3/8" FROM END
DETAILS OF THE REPLACEMENT EXHAUST STACKS
SOLDER RING TO THE CRANKCASE
20 GA. FLY-RING 2" DIAM.
OUTLINE OF JOINING PLATE IN POSITION
USE REGULAR PATTERN OF COVER TO CENTER THESE DRILLINGS
TACHOMETER CONNECTION SOLDERED HERE
HOLE FOR TACHOMETER DRIVE
CUT HERE
3/8" DRAIN HOLE FOR RETAINING
DETAILS OF THE TIMING-GEAR COVER
GREASE RETAINING CUP FROM MODEL "T" FORD 2 1/2" DIAM.
BRAZE
12 GA. STEEL
DETAILS OF THE JOINING PLATE AND OIL RETAINING CUP
12 GAGE MATERIAL
SCREWS ARE SOLDERED IN COVER
JOINING PLATE
NUT
CORK GASKET
GEAR COVER
CHANNEL STEEL MAGNETO SUPPORT
3/8" SCREW THREADED INTO THE SHAFT
CAM SHAFT
TACHOMETER DRIVE
3/8" CENTER DRILLED TO 3/8" AND SLOTTED TO FURNISH DRIVE
DRAIN COCK
THREAD TO FIT COUPLING
TACHOMETER HOUSING CONNECTION
DOWEL HOLES IN REAR PLATE
HOLES ON 3/4" CIRCLE
HUB PLATES 3" DIAM 12-GA. STEEL

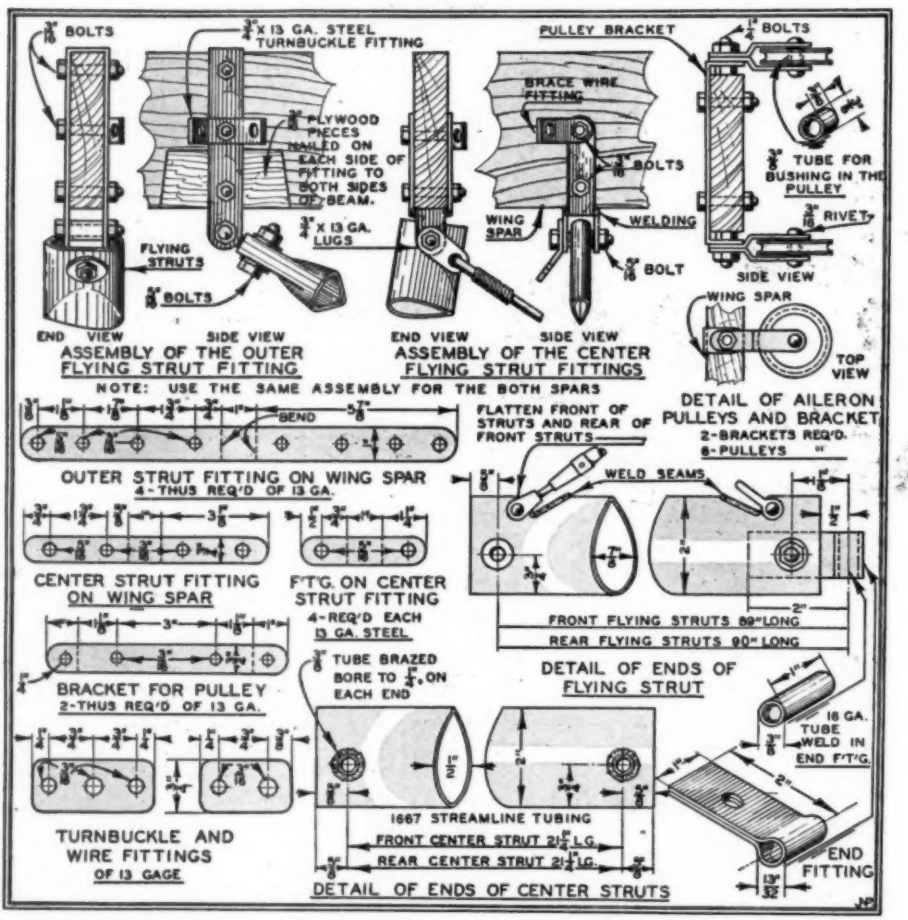
By studying this drawing you will see how easy it is to convert the "T" Ford for the Sky Scout. No water pump is needed.

Engine Mount and Upper Cabane Fittings Made of Cold Rolled Steel

SEE DETAILS OF ENDS OF STRUTS
1" BOLT
BRAZED
REAR CENTER FLYING STRUT
FLYING STRUTS ARE 1667 STREAMLINE TUBES
CENTER STRUTS LEAN BACK FIVE AND ONE HALF INCHES
INSIDE FITTING
DETAIL AT UPPER REAR CENTER STRUT
NOTE: SEE DETAILS OF LOWER FITTINGS ON ANOTHER SHEET
END VIEW
SIDE VIEW
OUTSIDE F'TG.
FITTINGS FOR THE UPPER REAR CENTER STRUT
2-REQUIRED OF 14 GAGE STEEL
INSIDE FITTING
UPPER ENGINE MOUNT AND REAR CENTER STRUT DETAILS
3" BRACE CABLE
S.E. # 325 TURNBUCKLE
3" X 18 GA TUBE
FUSELAGE
3" BOLTS
3" PLYWOOD ON SIDES FUSELAGE
END VIEW
INSIDE FITTING
UPPER ENGINE MOUNT
12 GA. STL.
BACK PLATE FOR THE SHOCK STRUT FITTING
4-REQ'D OF 14 GA.
325 S.E. TURNBUCKLE
FUSELAGE
3" PLYWOOD FUSELAGE SIDES
UPPER ENGINE MOUNT AND STRUT ASSEMBLY
SIDE VIEW
OUTSIDE FITTING
UPPER ENGINE MOUNT
2-REQUIRED OF 14 GA.
FRONT CENTER FLYING STRUT FAVORS OUTSIDE OF FITTING
CUT TUBE BEND AND WELD
ENGINE BEARER SUPPORT
CUT OUT 1/4" "V" AND WELDED TOGETHER FOR BEND
TUBE REINFORCING
WELDING
DETAIL OF BENDING AND REINFORCING MOUNTING TUBES

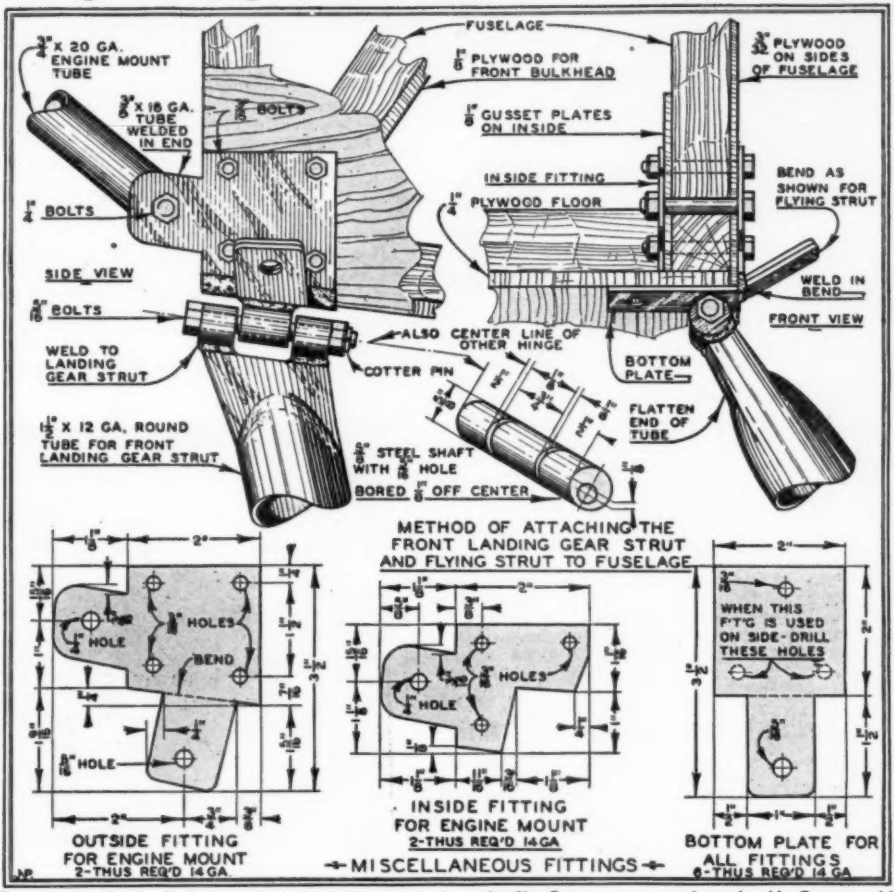
Here are shown complete dimensions of the upper engine mount plates and of the strut fittings and turnbuckles.

The Sky Scout is but a few inches larger than a Heath, but a few inches smaller than an Air Camper. It will fly nicely on the model T Ford engine and is very rugged. The ship will also make a very high speed "hot" ship with a Pack Mag "Cross Country Twin" 40 h.p. twin opposed motor. Note flap in rear of wing to admit pilot to cockpit.



Here are the details of the center section struts and the aileron pulley fittings. These drawings need no explanations.

Landing Gear Fittings of Type That Have Withstood Rough Handling


FUSELAGE
X 20 GA. ENGINE MOUNT TUBE
X 18 GA. TUBE WELDED IN END
BOLTS
PLYWOOD FOR FRONT BULKHEAD
PLYWOOD ON SIDES OF FUSELAGE
GUSSET PLATES ON INSIDE
INSIDE FITTING
PLYWOOD FLOOR
BEND AS SHOWN FOR FLYING STRUT
BOLTS
SIDE VIEW
WELD IN BEND
FRONT VIEW
BOLTS
ALSO CENTER LINE OF OTHER HINGE
WELD TO LANDING GEAR STRUT
COTTER PIN
BOTTOM PLATE
FLATTEN END OF TUBE
X 12 GA. ROUND TUBE FOR FRONT LANDING GEAR STRUT
STEEL SHAFT WITH HOLE BORED OFF CENTER
METHOD OF ATTACHING THE FRONT LANDING GEAR STRUT AND FLYING STRUT TO FUSELAGE
HOLES
HOLE
BEND
HOLE
HOLES
HOLE
WHEN THIS FIT'G IS USED ON SIDE - DRILL THESE HOLES
OUTSIDE FITTING FOR ENGINE MOUNT 2-THUS REQ'D 14 GA
INSIDE FITTING FOR ENGINE MOUNT 2-THUS REQ'D 14 GA
BOTTOM PLATE FOR ALL FITTINGS 6-THUS REQ'D 14 GA
MISCELLANEOUS FITTINGS

The same sturdy, ample fittings of simple design are used on the Sky Scout as were used on the Air Camper, with only minor changes. All bends must be made slowly, and done cold. It's important that all welding be well done.

a better looking job. Better have a tinsmith do this job well for you. In regard to the radiator lots of those building the Air Camper asked why I did not put the radiator below the fuselage. We have tried this on two ships and in both cases the climb of the ship was poor, the top speed five miles less. The motor overheated, and the draft and lack of supporting wind stream made the ship very tail heavy. Carried a passenger with difficulty and weighed more, and the same would hold true on the Sky Scout here.

The vision on these ships is good and the radiator does not bother. In fact the vision is better than one of the Air Campers using a Velie motor.

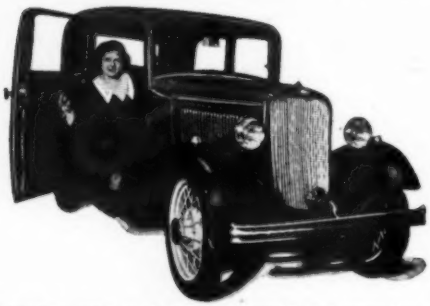
Now if you men want water pumps, mags and other things, I can furnish them. This is merely a part of the service which I am undertaking so that readers of MODERN MECHANICS AND INVENTIONS can be serviced with the least possible inconvenience to themselves.

It will not be necessary to use a new Ford T block for the ship. We can arrange a regrind job at a dollar an inch of bore on any old block, so that the new aluminum Ritefit pistons, which must be used anyway, can be cut to fit the new job just as well as an old one. Old T blocks used with the cast iron pistons very soon run out of round, and are hogs on oil as most of you know. With aluminum pistons cut with .007″ skirt clearance and .025″ head and ring gland clearance, the oil pumping and the blow-by compression losses are cut way down. The pistons are sold in the rough and are fitted for any prescribed diameter at the time of selling.

Mags and such stuff I can show you where to get if you'll write me at Spring Valley,

(Continued on page 182)

England's "Baby" Ford Rivals Size of American Austin



Decidedly 1932 in design, this "baby" Ford coupe has a track measurement of but three feet, nine inches and is England's latest contribution to the midget car field.

JOLLY old England must keep pace with the rest of the world "don' cha know", so naturally when the "baby" Ford made its initial appearance in London, recently, it was accorded the same curious interest that greeted the arrival of the Austin.

The new "baby" is very saving on gasoline and is powered by an eight horse power motor. Its small size can be visualized from the fact that it has a 7½ foot wheel base and a track measurement of 3 feet 9 inches.

It will be interesting to see how the "midget" automobile "takes" in England after being rather unanimously rejected in this country. As the photo shows, the car is a two-door coupe.

Aging Volcanoes Yield New Gold

THE study of volcanoes may lead the world to new gold mines. Many of the world's deposits of gold and other precious metals have been found in the kinds of rock which volcanoes eject in the later stages of their lives.

Youthful volcanoes throw out a lava which hardens into a black rock called basalt. As the crater ages, this basalt lava is replaced by kinds of a lighter color, differing in chemical composition and hardening into rocks called trachytes.

Valuable deposits of gold and other valuable metals are associated with this light colored lava.

Hedge Shears Run by 1 H.P. Motor

ONE of the practical new inventions displayed at the Exhibition Hall, Berlin, is the hedge shears which is operated by a 1 horse power motor carried on the back of the user. Motor can also be used for grass mowers, chaff cutters and ploughs with a great saving in time and labor.

The motor is harnessed to the back of the workman and operates the cutter by a flexible shaft connection.

The small one horse power motor harnessed to the workman's back provides the power for the cutter. Blades are operated by flexible shaft running from motor to instrument.

Camera Takes Picture of Burglar

When burglar touches one of the hidden switches a flash lights up the entire vault and camera takes picture simultaneously, as shown. Other device swings vault door shut.

ONE of the most notable devices demonstrated recently at Northwestern University's scientific crime detection laboratory is the automatic camera that takes a picture of the prowler or burglar.

The camera is placed so that a picture of the entire room is taken. Any number of little devices are "planted" in the vault which will operate the camera when disturbed. Photo shows how flash is thrown when prowler touches switch.

People Average Two Colds a Year

STATISTICS compiled by the Harvard Odontological Society show that the average person suffers two common colds each year and that they are apparently contracted by an infectious organism. These colds pave the way for the secondary invasion of the more serious diseases, such as pneumonia, if not thrown off.

SPARKS from the RADIO EDITOR

Edited by L. B. ROBBINS

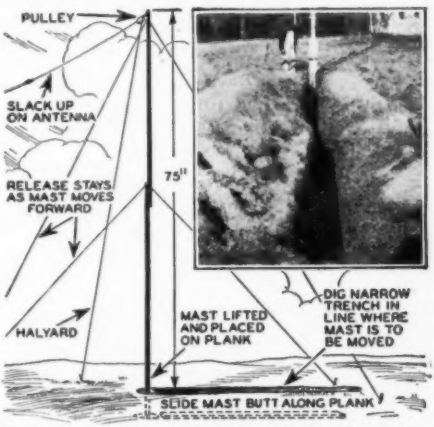
An Easy Method for Moving a High Mast

TO MOST radio fans the task of moving a high mast looks quite formidable, but it's in reality extremely simple, providing you follow the procedure described here.

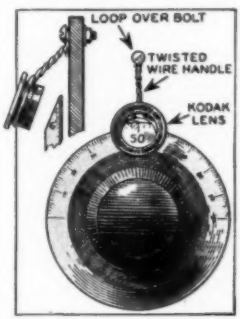
First off the bat, draft several friends to help you. Then set them to work digging a trench the depth of the mast butt, and extending from the present site of the mast to the point where you want to relocate it. Level off the bottom and lay down planks as illustrated in the accompanying drawing.

Then with everybody ready for the moving, the stays are slackened, and the mast butt jacked up, moved forward slightly, and set down on the plank. Now with stay bearers following, slide the mast slowly along the plank by hitches, until the new position is reached.

All that remains to be done now is to jack up the mast, set it on a new stone, and reset the stays, tying them down to pegs that have been driven in beforehand. Finally fill the trench and straighten up the mast.


PULLEY
SLACK UP ON ANTENNA
RELEASE STAYS AS MAST MOVES FORWARD
75'
DIG NARROW TRENCH IN LINE WHERE MAST IS TO BE MOVED
HALYARD
MAST LIFTED AND PLACED ON PLANK
SLIDE MAST BUTT ALONG PLANK

With stays slacked out as shown here, the mast is moved to its new location along the trench, dug to depth of the butt.



Lens magnifies the dial mark.

Kodak Lens on Dial Gives Precision Readings

SHORT wave receivers should have some means of reading the markings upon the dials precisely. To this end, a discarded kodak lens or a glass from an old view finder, supported in front of the dial scale, will be found of great advantage.

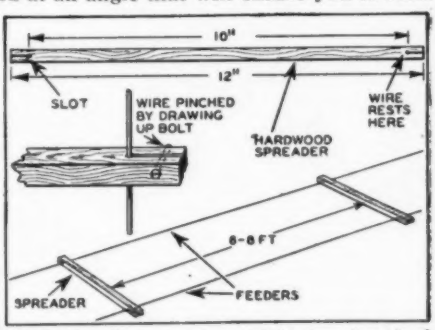
The method of using the lens is shown in the accompanying sketch. Wrap a piece of soft, heavy wire around the lens barrel as suggested, then draw it tight with pliers and twist up several inches to form the handle. Loop the end for a supporting bolt.

Now drill a hole in the panel above the dial rim and fasten this twisted wire handle to the panel by means of a small bolt. Then bend or adjust the wire handle so the lens is the proper distance from the dial scale and at an angle that will enable you to read the magnified scale easily. Lens from an old view finder also serves here.

Efficient Zepp Antenna Spreaders

MANY transmitting amateurs have difficulty in making spreaders for the two feeder wires. Here, however, is one way to make such spreaders which will bring returns to the builder in increased efficiency.

Cut as many pieces of hardwood as needed, 12 in. long by ½ inch thick (squared stock). Saw a slot in each end of the spreaders 1 inch long, ending in a hole the same diameter as the feeder wires. Then drill a hole through the ends of the spreaders as illustrated in sketch. For insulation boil spreaders in paraffin.



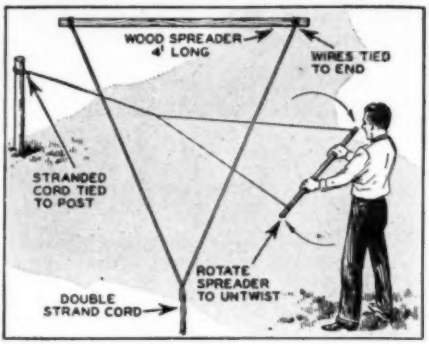
Feeder wires of zepp antenna are held secure in ends of spreaders by tightened bolts. Allow 6' between spreaders.

Wood Spreaders Make Unwinding Stranded Cord Easier

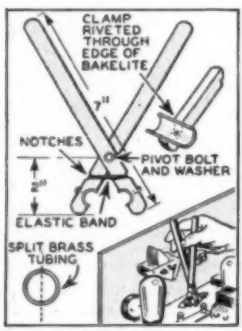
OCCASIONALLY you will have a long piece of double or triple stranded electric light or telephone wire that could be untwisted and used in radio work. Here's how to do the job in a speedy manner.

Untwist about four or five feet of the cord and tie the end of each strand to the end of a stick which we will call the spreader. Then fasten the opposite end of the cord to a convenient post or tree as shown. Stand back until the cord is pulled taut and then commence rotating the stretcher in the direction opposite from the twist in the cord.

With this scheme a 100-foot length of double-strand cord can be untwisted in only a few minutes, and moreover the strands will not become entangled with each other as they would if opened up by hand. The drawing illustrates procedure.



To unwind stranded cord, connect one end to post, attach wires of other end to spreader, and untwist.



Grid leak is removed by clamping split tube over the cylinder.

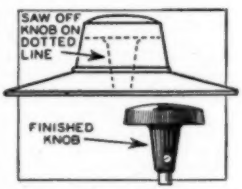
Bakelite Tongs Facilitate Removal of Grid Leaks

MANY is the time when the amateur has to reach down inside a receiver and pull out the grid-leak and replace it with another. A pair of tongs to ease the trouble somewhat is shown in the accompanying sketch. The handles are composed of two strips of bakelite or hard rubber. Round off the ends of the strips and pivot them together about 2 in. from one end with a small bolt and washers. Hollow out the inside edges of each piece near the short ends and then rivet or bolt in a half section of metal tubing about ¾ of an inch long. A heavy elastic band held by notches will close the tongs. These notches should be cut between the clamp and the pivot, in the outside edge of the strip, as illustrated in the drawing at left.

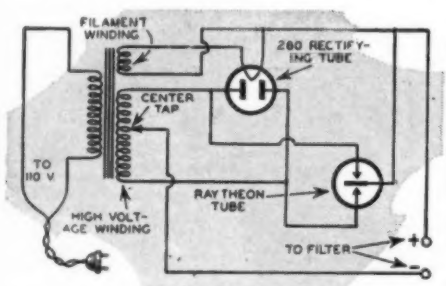
To use, pull the handles open, slip the clamps over the leak and then close the handles together. Pry one leak holder away with a pencil and the leak will lift out without trouble.

Here's How to Make a Knob From Old Tuning Dial

HOW many times has the radio builder wanted a knob when all he had on hand was old large-size dials. If that's your predicament you can take one of the dials and quickly turn it into a satisfactory knob. Hold the dial in the vise by one side of the disk, then wrap a strip of paper about the knob in the position shown by the dotted line in the accompanying drawing. Saw around this line with a fine hacksaw, being careful not to cut the spindle inside. When this is done you will have a knob similar to the one shown in the drawing at right.



After sawing knob through stock, as shown, lift top clear.



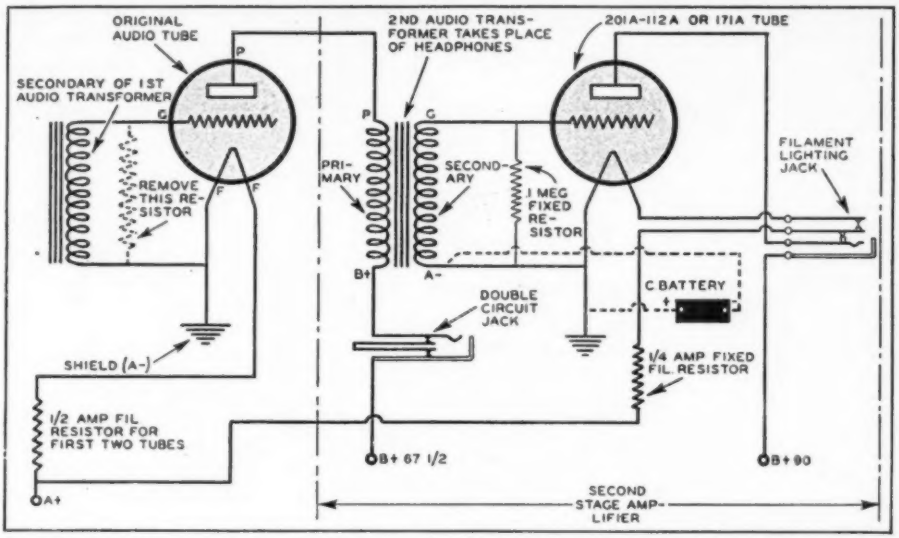
Here's how to hook the 280 rectifier and Raytheon together for alternate use in power pack. Keep the Raytheon tube out of the socket when the 280 rectifier is in operation.

Use Raytheon, 280 in Power Pack

THERE are times when the transmitting amateur would like to use a 280 rectifying tube along with a Raytheon in a power pack. Just how this can be done is shown in the hookup at the left. Attach the second socket to the power pack. Connect the terminal to the center element of the Raytheon direct to the plus output post of the rectifier, then connect each one of the side elements to a corresponding plate on the 280 tube.

Keep the Raytheon tube out of the socket when the 280 is in operation. Also, if the 280 is to be discontinued, remove it and insert the Raytheon in its own socket.

An Additional Amplifier for Your Short Wave Receiver



The additional apparatus for S. W. receiver is shown at the right. Second audio transformer is inserted in place of headphones. If higher than 90 volts are used, add the "C" battery in circuit. Various tubes use from 4½ to 9 volts.

MANY readers have expressed the wish for an additional tube with which to boost volume from the two-tube short wave receiver described recently in MODERN MECHANICS AND INVENTIONS. Such an additional stage is easy to construct, and will bring in signals with surprising volume.

To begin with, substitute a 3 to 1 ratio audio transformer for the 10 to 1 at present in the audio stage and remove the resistor from the secondary. Now, either on a second base or the end of the present one if there is room, mount the following apparatus.

An additional 3 to 1 or 5 to 1 audio transformer—inserting the .1 meg resistor across the secondary of this—a UX socket, a ¼-amp. filament resistor and additional shielding on the back of the panel. Then insert a double circuit jack in the panel near the first transformer and a filament lighting jack near the second transformer.

Hooking Up the Amplifier

Wire it up as shown in the accompanying diagrams. It will be noted that the plate lead in the second tube of the original set has been opened and the primary of the second transformer inserted in series. Also the phone jack formerly used has been removed and the closed circuit jack used instead. The plate voltage has been also reduced to 67½ volts.

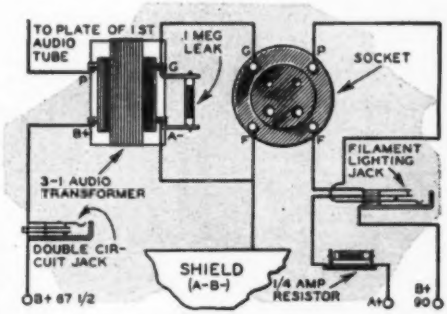
For the filament, a wire is connected directly from the A plus before the resistor controlling the first two tubes and goes to one side of the ¼-amp. filament resistor for this third tube. The other side of the resistor then connects to one filament switch prong on the last jack and the other prong connects to the plus terminal on the third socket.

The plate of the last tube is then connected to one of the bottom jack prongs and the remaining prong to the 90-volt B plus post. Negative filament legs are grounded to the shield as before.

Separate Jacks Light Filaments

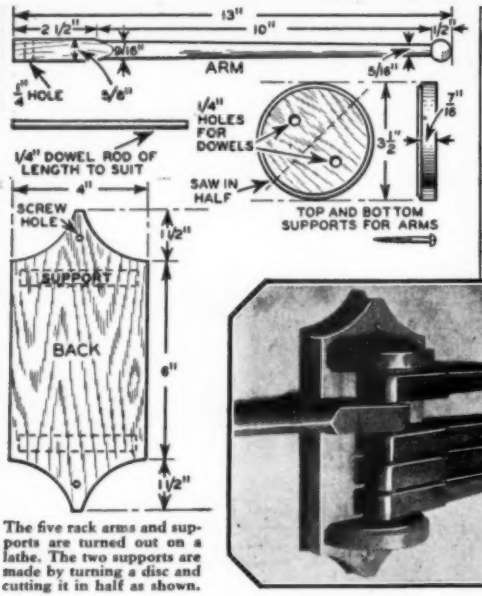
When the phones are plugged in the first jack, only the first two tubes will function the same as before. But when the phones are plugged in the second jack the second audio tube is lighted automatically and both audio stages will function.

If higher than 90 volts is used the grid of that tube will need to be biased depending on the type of tube you use. In this case, insert a C battery as shown by the dotted lines in the diagram. Various tubes will call for from 4½ to 9 volts.

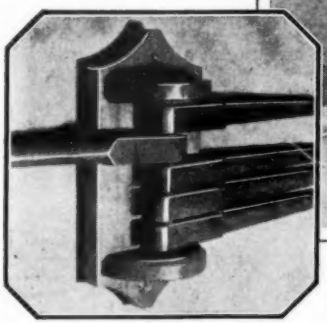


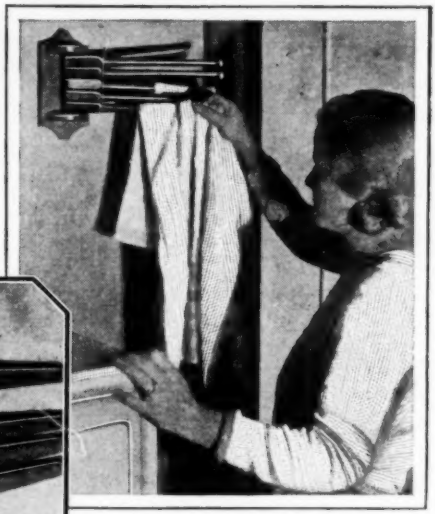
Here is how the parts are wired in second stage. Battery terminals will run to Fahnestock clips on the baseboard.

This Easily-Made Cloth Rack Proves Handy in Kitchen



The five rack arms and supports are turned out on a lathe. The two supports are made by turning a disc and cutting it in half as shown.





Finished in clear lacquer, the cloth rack, shown above, makes a neat kitchen or bathroom fixture. Funnel-shaped washers between arms prevent play and allow easy turning.

THIS kitchen cloth rack is just the kind of a workbench project that practical men will appreciate. It isn't difficult to turn out and it makes an excellent addition to the kitchen. Besides, it is an article that the enterprising shop owner can sell in various numbers in his own neighborhood at a price that will net him a nice spare-time profit.

The rack is done in sap gum with a clear lacquer finish and requires only two hours to complete. Rip up 5 strips ⅝ in. square and 13 in. long and turn them in a lathe to the shape shown. Chattering can be largely overcome by keeping the chisels very sharp and by making short, quick thrusts, instead of exerting steady pressure.

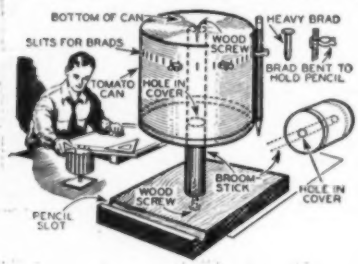
Another method to overcome chattering on long, slender pieces is to don a mitten and hold the back side of the work in the hand as the chisel cuts into the front side. Sand each piece well before lacquering and polishing. Do this in one operation and then bore the ¼-inch hole ⅝ inch from the end.

The back is cut out of ⅝ inch wood, sanded and finished in clear lacquer with two small screw holes placed as shown in diagram. The arm supports are halves of a 3½-inch disc. Each piece is provided with a ¼-inch hole.

Procure small washers and make them slightly funnel-shaped by enlarging the hole with a punch. One of these is placed between each top and bottom support, and each arm.

The ¼-inch dowel is now run through the 7 pieces and 6 washers and the ends glued into the half-disc supports. Before the glue has set, fasten the supports to the back with glue and nails or screws. It will be found that the arms swing easily and without play. Attach the rack to the kitchen walls with screws.

When turning these racks out in numbers, the working time needed to complete each rack can be easily cut down to 90 minutes.



Desk Pencil Holder Made From Tin Can

A HANDY desk or table pencil holder can be made in a jiffy from a discarded coffee or tomato can and a broom handle.

Saw out a wood block the size you wish and fasten an 8-inch piece of broom handle upright to the center of the block. Cut a hole in one end of the can so the upright can be pushed up through and fasten at the top, as the diagram on the left shows.

Cut slits in the side of the can with a knife, insert brads from the inside, and shape them around a pencil. The slot in block is optional.

Things to Make with Tools

Edited by A. NEELY HALL

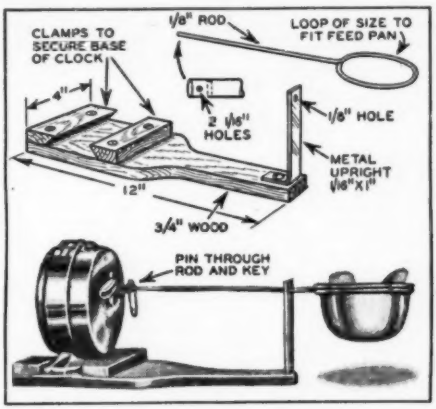
Make Your Alarm Clock Feed Your Dog

THE question of how you can feed your dog when you go away from home for a day is now solved. With this device, which makes use of a few spare parts from your work bench, all you have to do is set the alarm clock at the time for Bruno's meal and forget about it.

Construction of the contrivance which does the job is illustrated in the accompanying drawing. On the baseboard are screwed two blocks shaped as shown to hold the alarm clock in place. At the end of the board is mounted a metal upright made from 1/16 in. by 1 in. strap iron, with a ⅛ in. hole in the end as shown.

Bruno's grub is dumped from a pan held by a loop of heavy wire, which extends back through the hole in the upright and eventually connects with the alarm key of the clock by means of a pin.

When the alarm goes off at meal time, the key turns around. This upsets the pan, delivering Bruno his dinner.



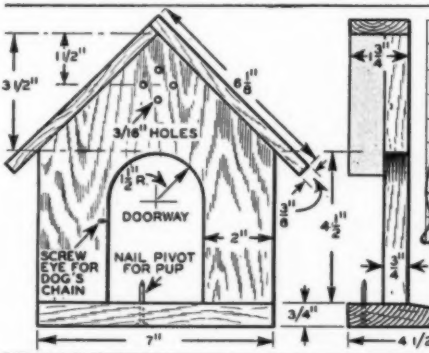
With clock rigged up as shown above, the pan is turned over by unwinding of alarm key, dumping contents to dog.

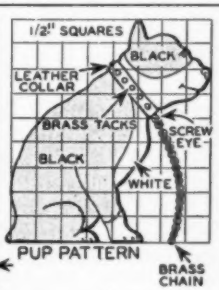
Here's Bull Pup That Guards Your Door and Keeps It From Slamming

HERE is a novelty door stop which will be admired by all who enter your home. The front of the kennel and the base are made of ¾-inch stock, the roof of ⅜-inch stock, and the dog of ⅞-inch stock.

Lay out the front and base by the front elevation and cross section given below. Cut one roof board ⅜ inch wider than the other to allow for its overlapping. Assemble the kennel with glue and finishing nails, setting the nail heads and puttying the holes. Apply two all-over coats of white enamel. Then paint the roof red.

Enlarge the pattern given for the pup below. Make a collar of a narrow strip of leather, and fasten it with a row of small brass-headed tacks. Fasten the dog to the base with a finishing nail placed in the position shown. This will pivot the dog so that it can be turned face to the front. Screw a brass screweye into the front of the kennel, and attach the dog's chain to it.

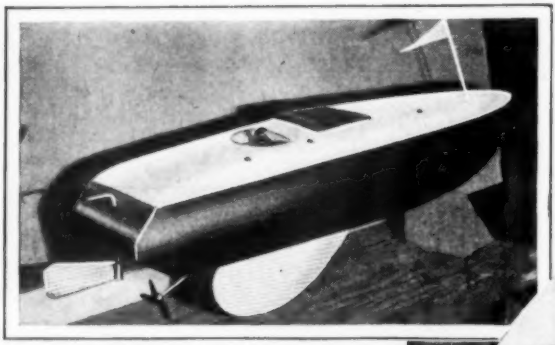




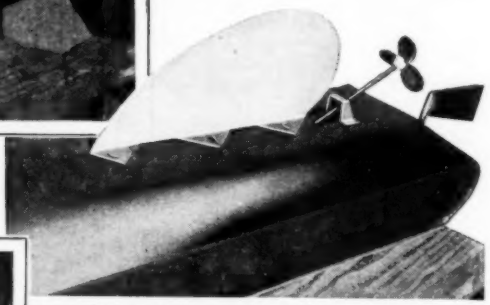
The pup sits outside the kennel, held securely by a brass chain.

In dimensions for pup house, note that rear of floor is beveled to fit under door. Trace dog pattern from squared chart.

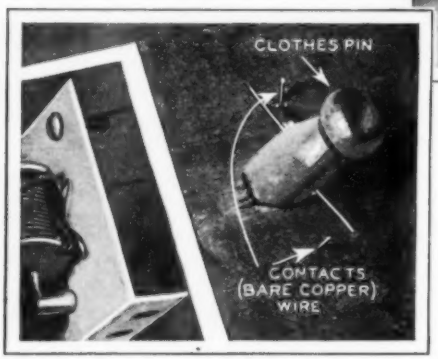
Toy MOTOR Powers This



Made of balsa wood and powered by an inexpensive little motor, this model speed launch will hit off a surprising clip, and her trim lines will win the admiration of any boating fan.



Here is the completed electric launch, ready to take to the water. Note the trim lines of the hull. Driver is seen seated in the cockpit. Turning him starts or stops the motor.



The driver, shown here, is simply a half clothespin fitted in cockpit. When pin is twisted, cross wire makes contact with pins to turn on motor. To turn off, switch other way.

THE dream of every boy interested in boats is to make one that will run under its own power. This is largely the reason for the popularity of the sail boat. Yet the electric launch has much greater appeal, for it can be driven under almost any condition.

The electric launch shown here was designed and built with this in mind, and it's a launch that will get right down and *perform!* For an engine, if you have a Meccano set motor, you can use this; while the battery is built up of a bank of 7, 9 or 11 dime store flash-light cells.

Power Plant Below Decks

The whole power plant is tucked away beneath the top deck to give a neat, streamline job. A simple means for opening and closing the circuit is also provided. That dummy driver you see in the cockpit is the top portion of a clothes pin.

Shaft should project from hull at about angle illustrated above. Note how keel is secured to bottom of hull. If the boat rides too high, add a heavier keel to increase the draft.

Two copper wires extend up through the wood, one on each side of him. These are the circuit line. A stiff copper wire extending through the clothes pin forms the arms and these also become the switch.

By merely turning this clothes pin dummy around to the right or left, you open and close the switch when the copper wires touch!

2 Pieces of Balsa Form Hull

Build up the hull of balsa. Two pieces 2 inches thick, 5 inches wide and 24 inches long will be needed. Make a clamp and coat each adjoining surface with best quality liquid glue. After 5 minutes' exposure to the air, place them together and clamp together. The piece can be removed after 5 hours.

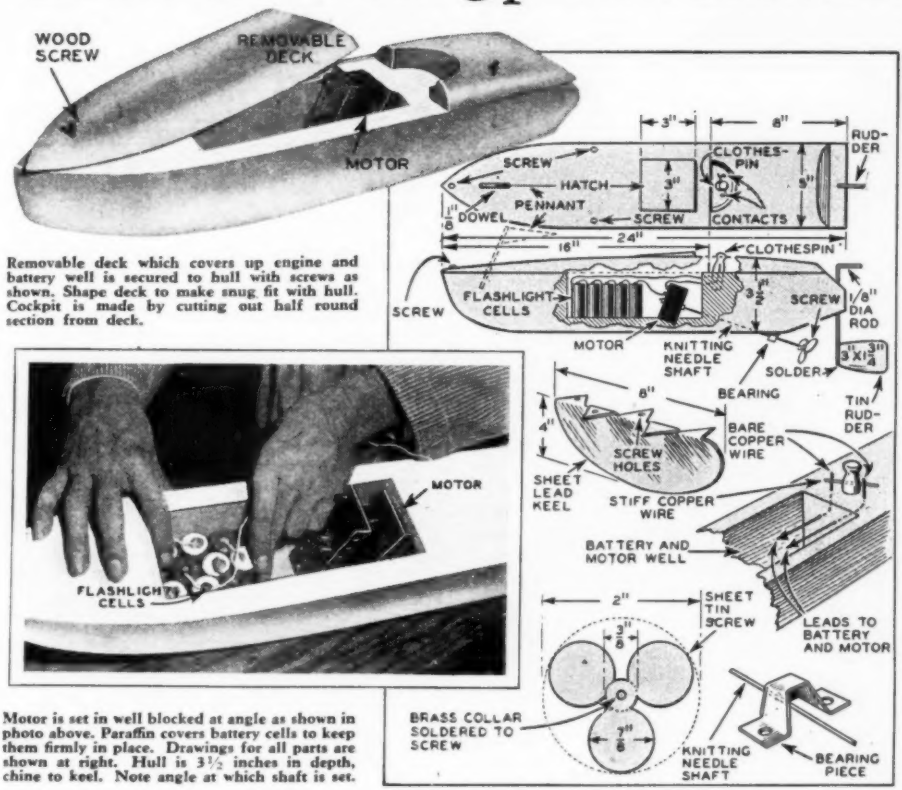
The hull shaping is optional, but graceful lines should be given the prow as indicated. Cut off the pieces from the stern as shown at the same approximate angle. These permit greater clearance for the screw and also for the handle to the rudder.

Seating the Motor

Give your motor the once over and determine just about how much space it will require in the hull. Add 1 inch to its width, then set your flash light cells in rows of 3 and find their combined length. This will give you the approximate length of the well in the hull.

You can cut this well with a sharp knife best, as a chisel will tear the grain. The

Trim Model Speed Launch



Removable deck which covers up engine and battery well is secured to hull with screws as shown. Shape deck to make snug fit with hull. Cockpit is made by cutting out half round section from deck.

Motor is set in well blocked at angle as shown in photo above. Paraffin covers battery cells to keep them firmly in place. Drawings for all parts are shown at right. Hull is 3½ inches in depth, chine to keel. Note angle at which shaft is set.

back end of the well can be square, but it can be slightly rounded in front.

Next, locate the best position for the motor. This power plant must be seated at such an angle as to bring the shaft down through the bottom of the hull with sufficient clearance for the screw at the end. Some blocking may be necessary to properly seat the motor.

Determine the point in the back end of the well at which the hole for the shaft should start, then bore this from both ends from ¼ to ⅜ inch in diameter so that the shaft, even with slight variation, will not rub the wood and increase friction.

Shaft Made From Knitting Needle

Get a knitting needle and to one end solder a small brass pulley which came with the motor. This will have a set screw by means of which the shaft can be attached to the motor shaft. Now put the shaft in place and make the tin bearing as shown. A hole very little larger than the needle is made through this for the actual bearing, then the piece is fastened in place with two screws.

In the same manner you can attach the screw. First, cut this out 2 inches in diameter, of the shape shown, from fairly heavy tin. To its center solder a small brass collar, also with set screw so that it can be readily removed.

Packing Made From Oiled Cotton Batting

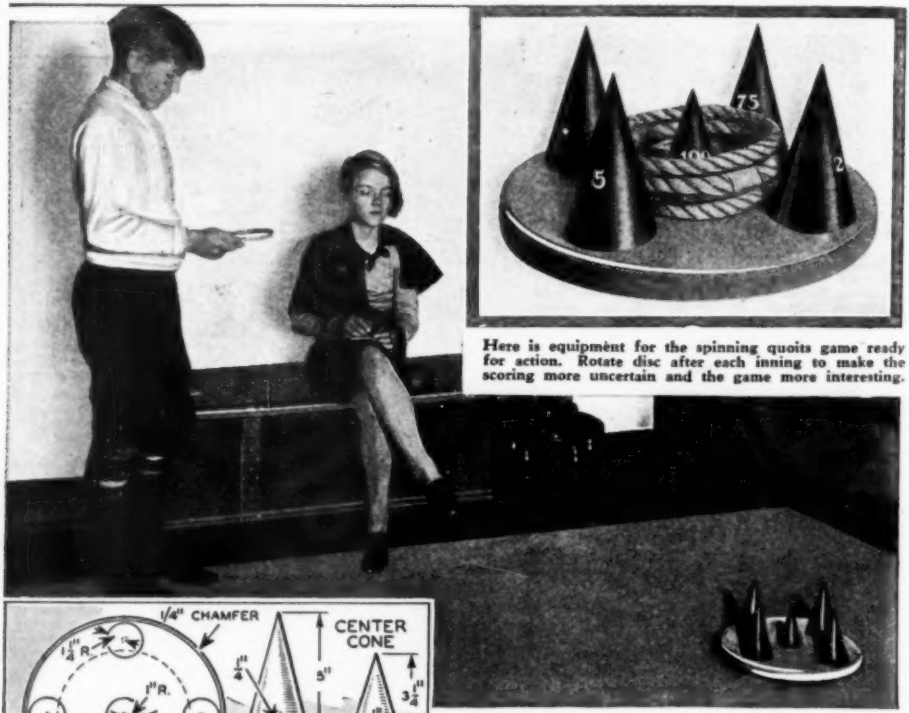
Tentatively turn the motor to be sure that no portion of the moving parts bind. Then assemble with the motor fastened with screws. Finally soak some cotton batting with oil and pack loosely in the top and bottom of the hole running through the hull to exclude water.

Assemble the battery by soldering short wires from the top of one cell to the bottom of the next, and so on, finally bringing the lead wires to the binding posts of the motor. See that the motor turns freely, then quickly break the circuit.

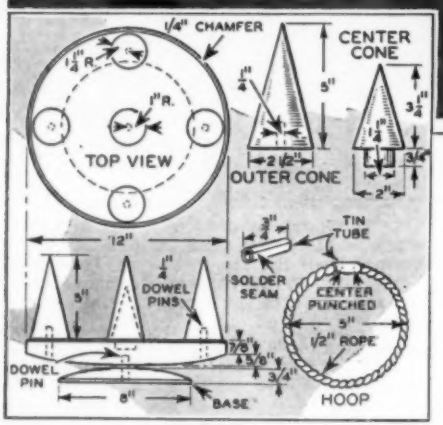
Extend one wire from the battery up through the wood of the hull as indicated at one side of the hole for the driver. Run another wire from the disconnected binding post of the motor up to a similar posi-

(Continued on page 189)

Spinning Quoits — New INDOOR Game



Here is equipment for the spinning quoits game ready for action. Rotate disc after each inning to make the scoring more uncertain and the game more interesting.



Dimensions for all parts are given here. Upper disc rotates on the base by means of dowel pin. Ends of rope quoits are joined together with the metal tubes and center punched.

SPINNING quoits is a game that has all the entertainment features of horseshoes, and requires every bit as much skill, if not more. Instead of a stake, however, you have five revolving cones, and instead of tossing horse shoes you toss loops of rope.

All the stationary parts can be turned on the lathe, using white pine for discs and gum wood for the base and cones. A ⅜-in. birch dowel connecting the base and the disc serves as an axis upon which the latter revolves.

In playing the game set the cones at a distance of from 12 to 20 feet. Player should aim for the center cone, which gives 100 points. Score can run to 500 or 1000 points.

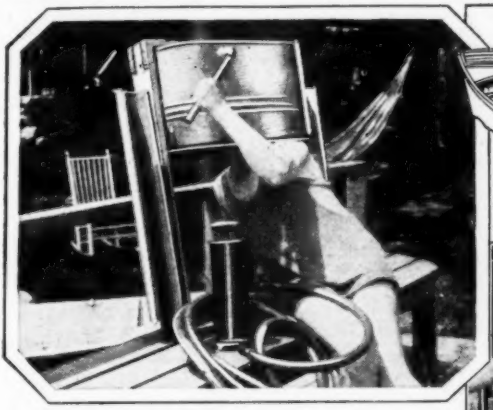
Four equidistantly spaced holes are bored through the disc for the dowels which secure the cones. These cones are easily cut on the lathe, and their finish consists of coat of filler and stain. A ¼-in. hole one inch deep in the center takes the dowel.

The fifth cone, which occupies the center, is turned with a dowel as illustrated in the drawing.

The base proper is turned with a small shoulder ⅛ in. thick and one in. in diameter for the top disc to ride upon. A hole should be bored clear through the center of the base for a ⅜-in. dowel pin, which continues for one inch to fit into the hole in the above disc.

Good quoits can be made from lengths of ½-in. rope, 17 in. long. Join the ends together with tubes made from heavy galvanized iron ¾ in. wide and about 1⅜ in. long. Wrap these pieces around the ends of the ropes, then solder the laps firmly. Finally punch each edge of the tin joints with a nail on opposite sides deep into the rope.

Wash Boiler Makes DIVING OUTFIT



Diver ready to go down in wash-boiler outfit. A $300 outboard was recovered from 18 ft. of water with this apparatus.

EXPLORING the bottom of a lake is unusual sport. There are two requirements for the adventure; first, an ability to swim, and second, suitable equipment to furnish air for the explorer.

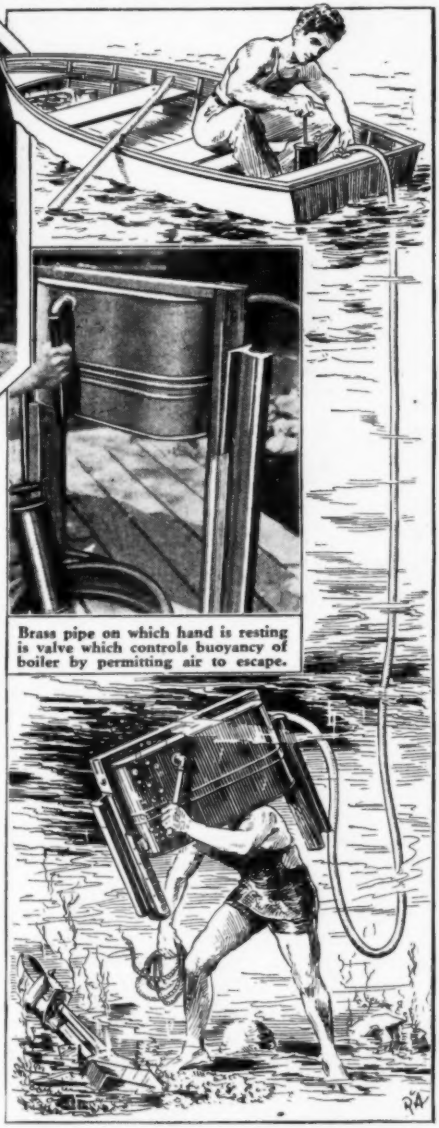
The apparatus used to supply air to the explorer using the outfit shown in the drawing above, is made from a wash boiler. This is fitted with a hose connection near the bottom, to which a 25-foot length of garden hose is attached. The other end of the hose is connected to a hand pump—a good-size tire pump will do. In the air line near the pump a check valve is inserted in order to hold the air in the boiler when it is under water.

In use, the boiler is inverted in the water. It rests lightly upon the diver's shoulders and the air imprisoned in it accompanies him on his trip to the bottom. Of course, it would be impossible to sink this improvised diving "bell" without additional weights, and these are supplied by two sections of rail mounted on either side of two wood legs of 1-in. by 6-in. cypress which extend 18 inches below the rim of the boiler. The boards themselves are attached to the boiler with large brass bolts well soldered on the inside to prevent leakage.

Angle iron sides cut to suitable lengths, drilled and screwed to these cypress boards, form a runway into which the flanges of the rails may be easily slipped.

In order to make the "bell" float so that the upper surface is flush with the surface of the lake, the weights must be proportioned in accordance to the cubical contents of the boiler. In other words, the combined weight of the two pieces of rail equals the weight of water that the boiler would hold.

The "bell" is controlled by a novel form of valve attached to one side. This consists of a piece of brass pipe connected to an elbow soldered into the boiler near the bottom. The end of this pipe is just flush with the rim of the boiler. When the pipe is vertical the boiler will float, but if the valve is tilted a little, enough air will escape to allow the water to rise slightly inside the boiler; its buoyancy will be overcome and it will slowly sink, carrying the diver with it.—Charles T. Corse.



Brass pipe on which hand is resting is valve which controls buoyancy of boiler by permitting air to escape.

How the simple boiler diving outfit operates is shown here.

MOTOR MECHANICS

Edited by RAY F. KUNS

A Tailor-Made Trunk for Your Car

WHEN you cannot buy the type of trunk you want for your car the thing to do is to build one. Trunks to be of utmost service ought to hold considerable quantities of baggage and camping paraphernalia. They ought also to be designed to fit the car.

There is no need to worry about the trunk building job's being too difficult. Nor is there any occasion to fear the wisecracks of your neighbors when the job is finished. Those who smile at the idea of the handyman-car-owner building a trunk which would look fit are likely to find themselves envying the results of the effort.

Laying Out the Job

First consider the space into which the trunk is to be fitted. Measure the space ahead of the rear bumper, allowing several inches in front of this for the rear line of the trunk, if this is possible. Next measure the width between the fenders and figure how much length you can allow and still have good lines. The next thing to do is to measure the height below the window line or body trim molds of the car to determine the height of the trunk.

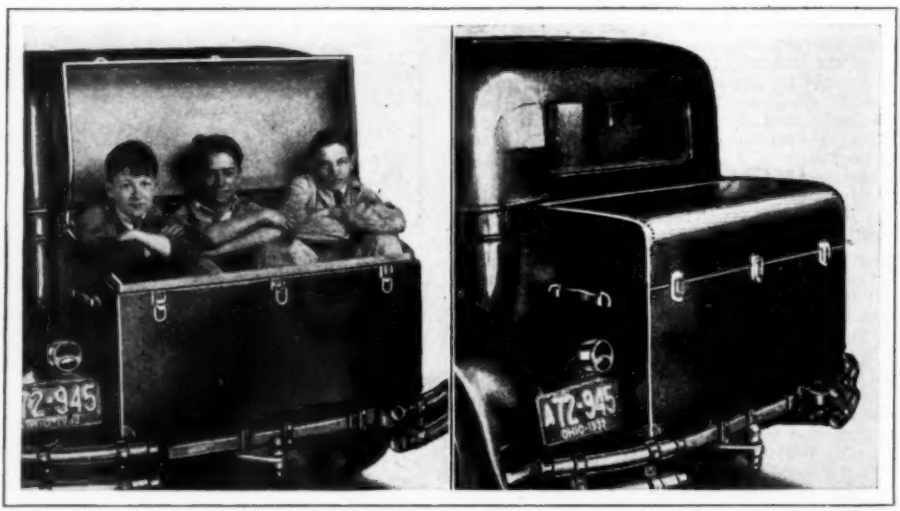
Take the baggage which you expect to put in the trunk and set it on end on a piece of cardboard. Mark around the baggage, allowing a little bit of room on all sides. This will give you the approximate size required for the inside of the trunk. Now, having in mind the dimensions secured previously, lay out the style of the trunk end on the cardboard. Cut the cardboard to these lines.

Trunk Fits Design of Car

Place this in position on the car and "size it up" from the side. This ought to give much the same impression as might be gained from the side view of the finished trunk, shown on page 159. When viewed from this position the trunk ought to match in width the lines of the car as well as possible. The width or the height or the curves of the end may need to be changed to get harmonious design.

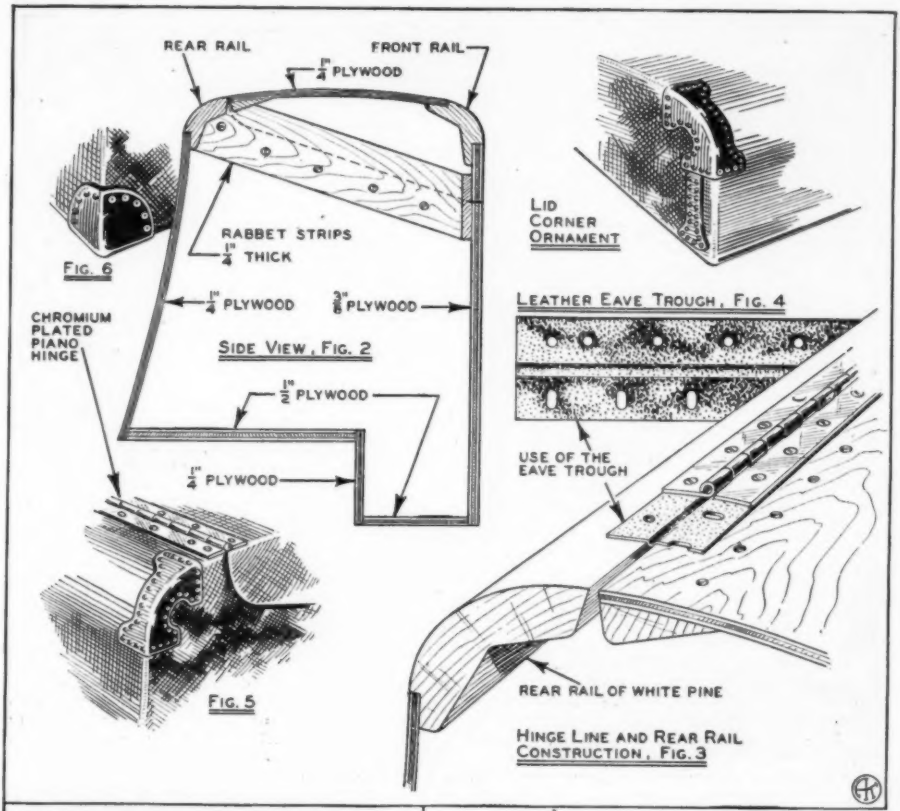
Having determined on the design of the trunk end, most of the lines of the trunk are thereby definitely determined. By referring to the illustrations it will be noted that most of the curves appear on the end or cross section views and lines between the two ends are approximately straight.

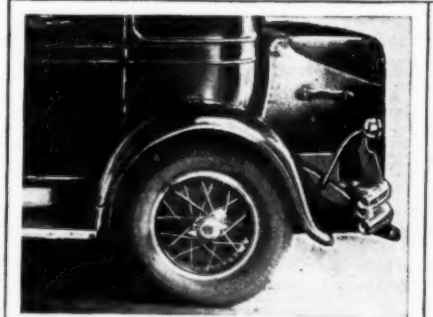
Fir plywood is used for the trunk panels. This is in different thicknesses, depending upon the points of strain. The trunk is covered with imitation leather. It is lined on



You'd never guess that this trunk is a home-built job. You can build one especially for your own car and save something like $30 or $40. It's large enough to accommodate three 15-year-old youngsters, as shown in the photo above.

Size of Your Car Determines Dimensions of This Custom-Built Trunk





Details of trunk construction are shown in this drawing. Dimensions are not given, since trunk will be tailored to size of your particular car. Photo at left shows side view.

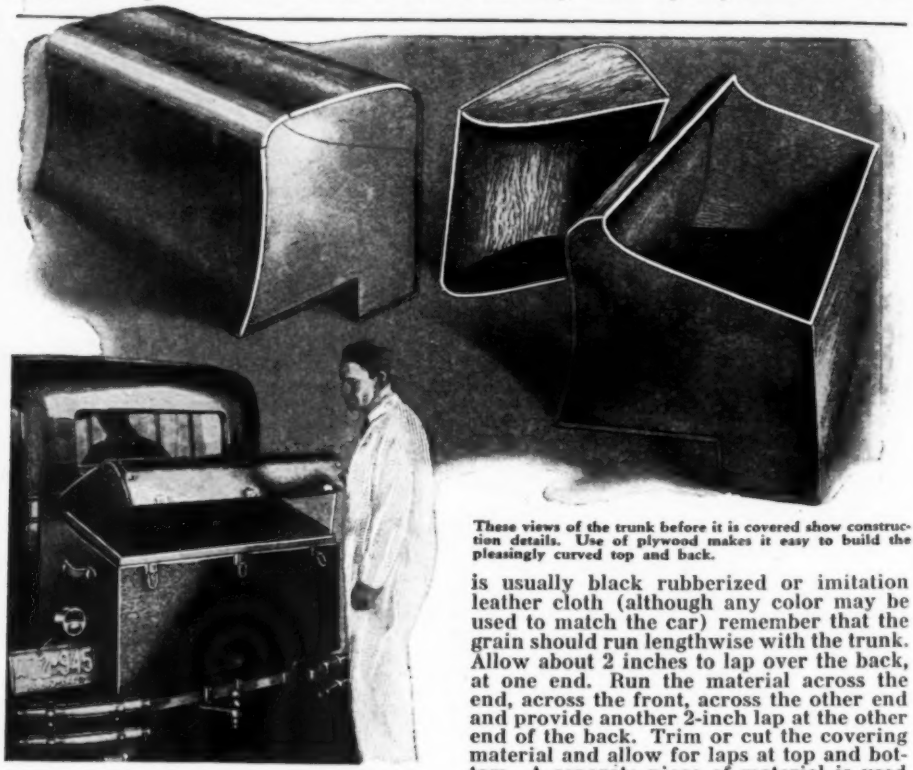
the inside with figured oilcloth. For a large trunk the ends should be laid out on ½-inch 5-ply fir panels. Use the pattern made previously for laying out the inside lines of the ends, since the sides of the trunk are nailed to the ends with a butt or lap joint. Next proceed to cut the curved lid line on the ends, using a band or jig saw. Mark the pieces to match to prevent confusion. Next proceed to make up corner rails. You will likely be able to make these from 4x4 white pine.

All parts should be cut to fit on the full size pattern of the end. This will give you the rear panel, top panel, bottom panel and front panel. Mark the front panel and rip on the proper angle to match the angle of the lid part line. It is suggested for a large trunk that the top and rear panels be ¼-inch 3-ply, the bottom ½-inch 5-ply and the front ⅜-inch 3-ply. This may be varied to suit the builder.

Use Waterproof Glue

When assembling the panels use casein water-proof glue and nails. If the trunk is to receive more than ordinary hard usage, it would be a good plan to use a light angle iron in the inside corners or you may cut a strip of triangular mold and glue it into the corners. The appearance of the partially finished trunk is shown in one of the illustrations. This particular trunk, in order to fit over the gas tank, made use

Round Top and Trunk Corners Are Easily Built if Plywood Is Used



Design of the trunk top makes it easy to lift, giving plenty of clearance for baggage. Oilcloth finish is used inside.

These views of the trunk before it is covered show construction details. Use of plywood makes it easy to build the pleasingly curved top and back.

of a drop in the bottom, giving a space into which a suitcase may be set.

One suitcase was laid flat in back of this first suitcase and a third suitcase went on top, leaving room for an aviation bag at the end. This particular trunk is approximately 24 inches high and 24 inches wide, not figuring the drop in the floor. This drop is 5 inches deep and 8½ inches wide. When the trunk has been partially finished, it is a good plan to fit it to the trunk rack. That is, the holes for mounting should be drilled.

Making Lid Joints Water-tight

Next prepare the rabbet strips which make a water tight joint for the closing of the lid. These want to be about 4 inches wide and run along the two ends and the front. They are fastened from the inside with screws. They are not fastened permanently until the trunk is being lined.

In order to secure a nice appearing job use cotton wadding to cover the outside of the trunk. This may be held in place by means of glue or a few small tacks. These should be copper to prevent rusting.

When applying the trunk covering, which is usually black rubberized or imitation leather cloth (although any color may be used to match the car) remember that the grain should run lengthwise with the trunk. Allow about 2 inches to lap over the back, at one end. Run the material across the end, across the front, across the other end and provide another 2-inch lap at the other end of the back. Trim or cut the covering material and allow for laps at top and bottom. A separate piece of material is used to cover the lid, another piece being used to cover the rounded section at the top and the back, three pieces of material being used to cover the entire trunk.

Corners Should Be of Leather

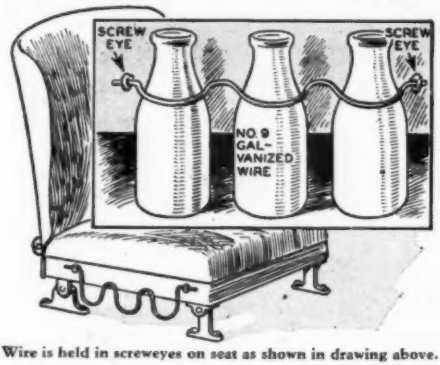
Before covering the lid and the back, the type of leather corners which are to be used for decoration and covering of the joints in these two pieces must be determined. If these cannot be purchased make them up from a grade of leather which you may secure from any harness shop or cobbler. If you will treat the leather by soaking it in water over night you can form it to almost any shape you desire, even around the corners, although the lower corners can be formed by cutting out a section. The curved upper corners can be brought to shape by exercising a little patience.

Round-Head Tacks Are Decorative

Corners are attached to the trunk by means of nickel-plated copper or brass tacks. These have a round head for decoration. When nailing on the corners space the heads about ⅜ of an inch apart, clinching any of the tack points which come through. The general shape of these corners is well

(Continued on page 180)

Carry Milk Bottles Safely in Auto With Wire Holders



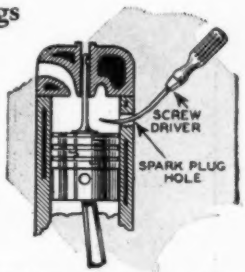
Wire is held in screweyes on seat as shown in drawing above.

A PIECE of No. 9 galvanized iron wire or a short length of 3/16" brass welding rod or similar metal may be bent into the form illustrated in the accompanying drawing to form a holder for milk bottles so that they will not be thrown over when rounding curves or when stopping the car quickly. The device is attached to the side of the driver's seat, or any other convenient place about the car. After the device is bent up it is sprung into screw eyes. When not in use it folds down along the seat. It should be installed at a proper height to permit slipping the bottles under as the wire is raised. With the screw eyes set in place, insert the holder ends and let go. Tension will suffice to make them stay put.

Screwdriver Makes Tool for Replacing Valve Springs

OWNERS are sometimes caught out on the road with a valve which fails because the valve locking device has dropped out. When repairs are attempted, a real battle starts. Every time an attempt is made to place the valve spring in position, the valve (overhead type) will drop back into the cylinder.

In order to hold the valve up while the spring is being reassembled a screw driver blade, bent as shown in the accompanying drawing may be used to advantage. Aim to get the end of the tool bent so that it will come up under the valve head when inserted through the spark plug hole. If this can be accomplished, the valve spring ring and lock may be assembled, while the valve is held closed.

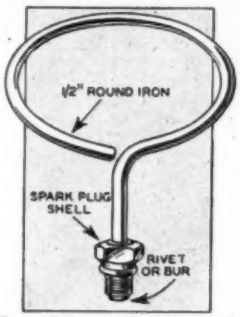


Hold up valve with screwdriver inserted through spark plug hole.

For Lifting Cylinder Head

EVERY auto mechanic has experienced difficulty with lifting the cylinder head. There does not seem to be any place to get a hold of. All of this trouble may be overcome by making one or two lifting hooks or handles such as that illustrated herewith. Take an old spark plug, remove the porcelain so as to save the spark plug shell. Insert a piece of ½" or other round iron. This may be riveted to hold it in the shell, or the shell may be threaded and the end of the iron likewise threaded, so as to assemble the two. Bend the other end of the iron into the form of a handle.

Now, when removing the cylinder head remove the spark plug and screw the lifting hook into the spark plug hole. If two of these are used, they should be placed at opposite ends of the head. If one only is used, place it as near the center of the head as possible.

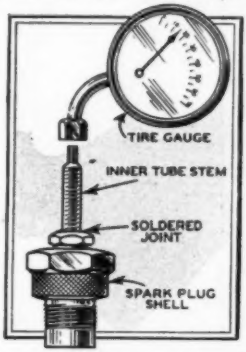


Screw lifting hook into a spark plug hole and raise with handle.

Use Tire Gauge to Test the Cylinder Compression

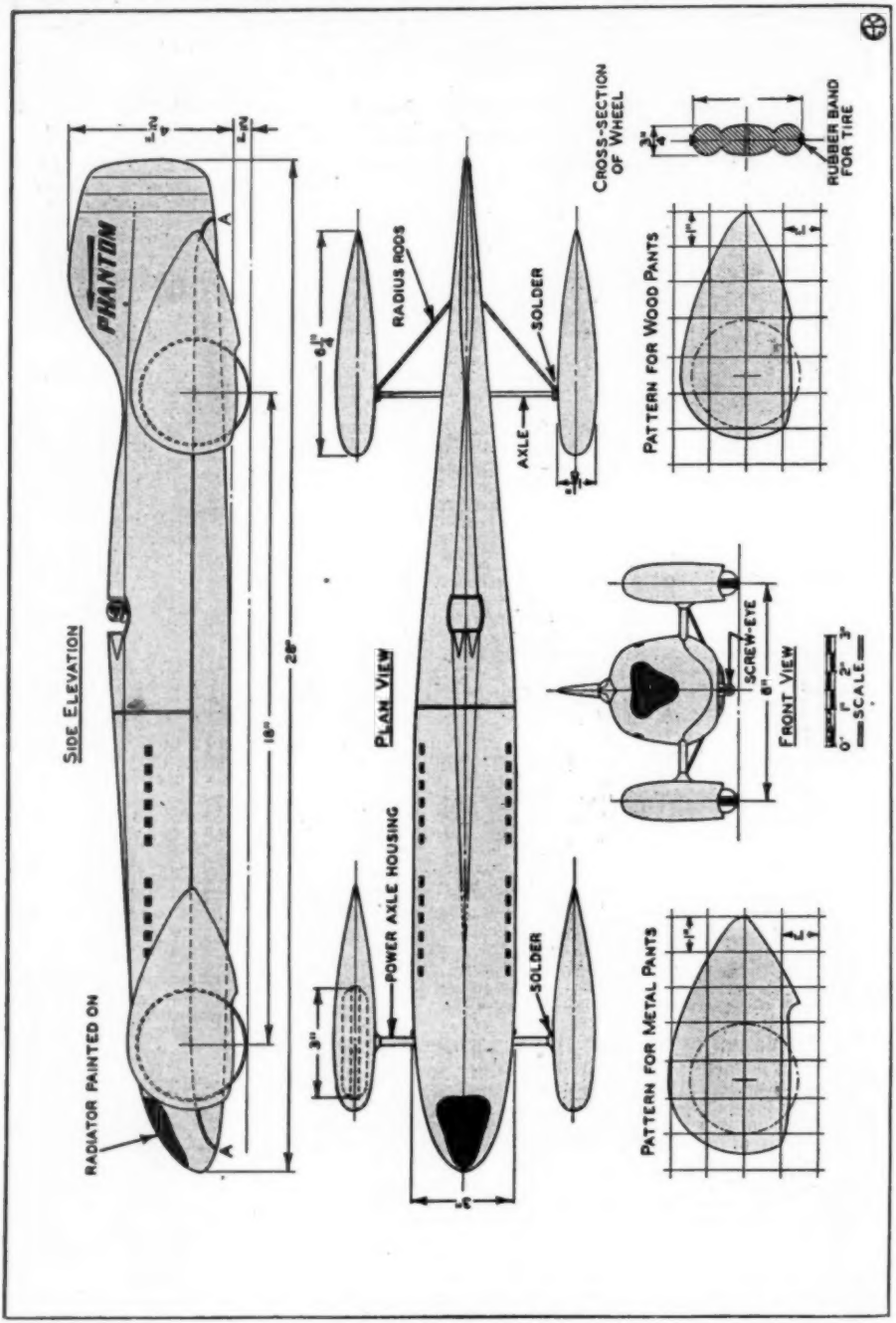
ANY car owner may devise a cylinder testing gauge from his tire gauge. Use a spark plug shell which will fit your engine and the tube stem from an old inner tube. Fit the tube stem to the spark plug shell by soldering or other means. When testing the engine screw this improvised device into the cylinder being tested in place of the spark plug. Turn the ignition off and have an assistant crank the engine with an electric starter, while you hold your tire gauge in close contact with the top of the tube stem.

Make several tests and record the average result for the cylinder tested, after which test each cylinder in turn. The results should average approximately the same. If there is a variation of over 10 lbs., the trouble should be sought and remedied. The most usual source of trouble is bad valves, next comes bad rings and cylinder faults.



Tire gauge fitted over the stem shows the cylinder compression.

18-Strand Power Rubber Motor Drives the Phantom Model Speed Car

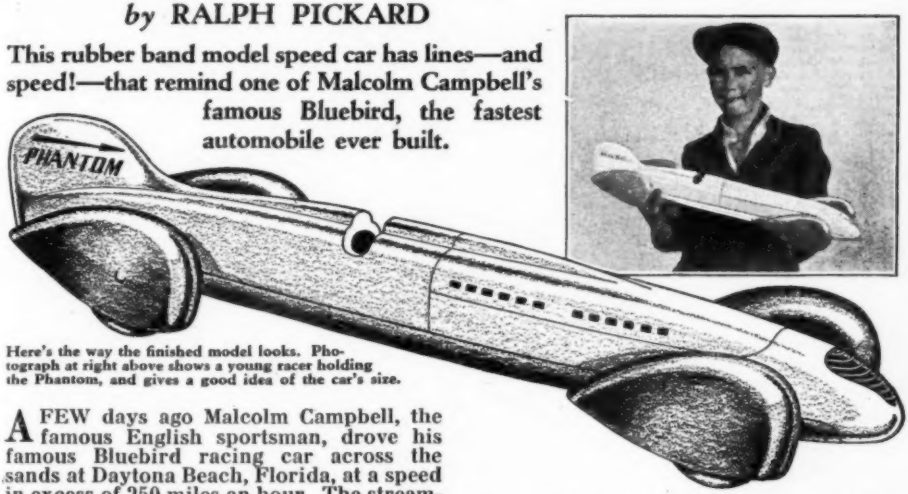


Side elevation and plan view above give an excellent idea of the steamlined appearance of the Pickard Phantom.

A Model Speed Car that Races!

by RALPH PICKARD

This rubber band model speed car has lines—and speed!—that remind one of Malcolm Campbell's famous Bluebird, the fastest automobile ever built.

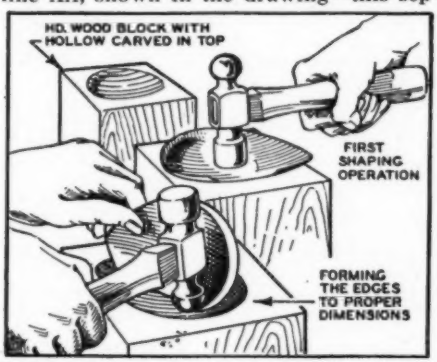


Here's the way the finished model looks. Photograph at right above shows a young racer holding the Phantom, and gives a good idea of the car's size.

A FEW days ago Malcolm Campbell, the famous English sportsman, drove his famous Bluebird racing car across the sands at Daytona Beach, Florida, at a speed in excess of 250 miles an hour. The streamlined car in which he set the record was the inspiration for the design of the Pickard *Phantom*, which I am about to describe.

The *Phantom* is a 28-inch model driven by rubber bands. She develops plenty of speed to run away from you on a smooth track. If you are the first model builder in your neighborhood to build one of these cars, you'll soon find yourself the center of interest and before long a dozen others will be in process of construction. That all adds to the fun. With two or more *Phantoms*, race meets can be held in which the best built car will invariably bring home the bacon.

Building the *Phantom* is simplicity itself. First you'll need a well-seasoned block of white or sugar pine, 3″x4½″x28″. Sketch the outline of the body, to the dimensions given in the drawing on the opposite page, upon the block and cut it out. Cut along line AA, shown in the drawing—this separates the chassis section of the car from the upper body.



Shaping metal wheel pants is simple when done like this.

A block plane and spoke shave will be helpful in shaping the body to the section shown in the front view. Carving tools will be handy in shaping the rudder and headrest fairing. Interior of both chassis and body should be hollowed out, leaving walls ¼″ in thickness.

Turning the Wheels

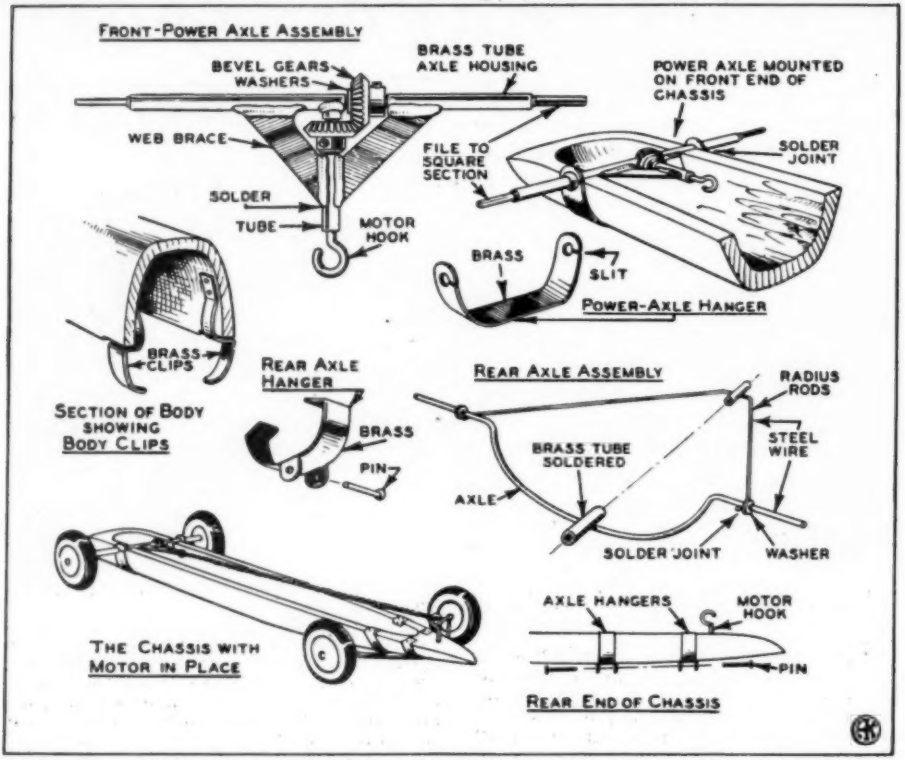
Wheels are turned out of maple and a groove 1/32″ deep by ¼″ wide is cut in the tread to accommodate a wide rubber band which is used as a tire. Drill a 3/32″ hole through the hub of two of the wheels, and drill the remaining pair to take brass bushings of ⅛″ diameter.

Phantom is a front-wheel drive car. The front axle housing is made of 5/32″ diameter brass tubing, while the axle is ⅛″ drill rod. The web braces holding the housing together, as shown in one of the drawings, are pieces of 20 gauge sheet steel. This drive unit is the most important part of your racer, so be particular to make a good job of it.

Front Wheel Drive Gears

Gears may be easily obtained from a mechanical construction set, or can be purchased separately at the five and dime. They should be of brass, with set screws to tighten them to the shafts. When soldering the housings, leave a little play for the gears, as they must run freely. If gears are too loose, play may be taken up with washers.

When the gears are set to your satisfaction, take a file and cut fairly deep notches in the shaft to hold the set screws tightly. File the projecting axle ends to a square



Small construction details of the Phantom are given here. Note the front-drive axle construction and placing of gears.

section and drive the wheels with 3/32" holes onto the square ends of the axle.

If you have any difficulty securing these little gears, you can make a pretty good substitute from the business end of an egg-beater, which usually has a bevel gear system of this order.

Make the rear axle of ⅛" rod, and the radius rods of piano wire. Bend both axle and radius rods so they will fit underneath the chassis, and solder ¾" lengths of ⅛" brass tubing to their centers in a horizontal line to act as a pivot insuring all wheels remaining on the ground. Aluminum straps are used to secure rear axle to chassis.

Wheel pants may be carved from wood if desired, but are more durable if made of metal, preferably hammered out of sheet brass or zinc. To make the fairings cut eight pieces of metal according to the pattern given in one of the drawings. Place the metal on a block which is slightly hollowed out—a detail drawing makes the method clear.

Hammer the metal to shape, and be sure to make four right and four left halves which are to be soldered together. The two pants for the front wheels have slots cut on the inside to slip down over the axle. The rear pair have a ⅛" hole drilled on each side.

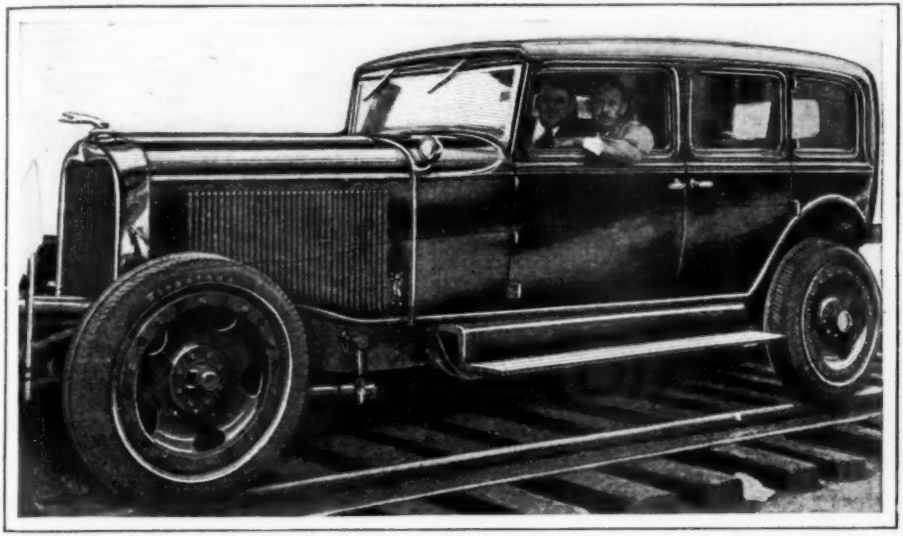
Just behind the strap holding the rear axle, force a sixpenny box nail through from underneath. Slip a washer over the nail and solder to hold it in place, then bend nail into a hook to hold the rubber bands. Body clips to hold fuselage section to the chassis are made of spring brass or clock spring, bent to shape and fastened in front and rear of body.

To assemble, the front axle is fitted halfway into the chassis and held there by a brass strap which passes underneath. This strap has a hole drilled in each end into which the axle is soldered and held fast.

Pants with slots are then slipped over the front wheels so that the end of the slot rests on the axle housing, where they are soldered. When pants are lined up properly they do not drag. Rear pants are attached by holding the chassis on its side. Start pants on the axle, then put in two small washers, working axle in just enough to hold them in place, then put wheel in and two more washers. Finally push axle clear through, and after lining up solder pants into place.

Power required is furnished by 18 strands of 3/16" flat rubber.

Flange-Tired "Rail Auto" Rivals Trains



Equipped with flanged pneumatic tires, the car shown above clipped 42 minutes off the old rail speed record between Miami and Jacksonville, Florida, by traveling the 408 miles in 378 minutes. Average speed on this run was 64.39 m.p.h.

50-party Switchboard for Desks

MIDGET switchboards, which are attached to your phone, have been invented by a telephone company in Germany. This switchboard consists of a small cabinet, shown in the photo below, which enables the customer to call 50 different parties without using the dial.

The numbers are "set" in the switchboard mechanism and all that is necessary when calling one of the parties listed is to run the indicator to the desired line and press lever in front of the board. Connections are thus made speedily and without the delay of dialing.

With this switchboard attachment connections can be made with 50 parties by setting indicator and pressing front lever.

JUDGING from the results of a recent test run made between Miami and Jacksonville, Florida, pneumatic-tired rail buses are going to speed up transportation considerably in the near future. Beating the previous record for train time between these two cities by 42 minutes, the automobile, shown above, traveled the 408 miles in 378 minutes—an average of 64.39 miles an hour.

The new type of tire, which is equipped with flanges to keep the car on the tracks, has passed a number of adaptability tests both in this country and abroad. Engineers who have witnessed these tests have been convinced of their practicability, and have expressed the belief that the entire industry will be revolutionized by their use.

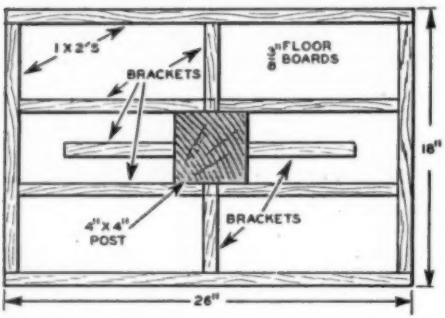
Besides speeding up rail travel, these flange tires loom up as a factor which will bring back to life the many branch lines now lying idle due to the high cost of upkeep and train operation.

Civilization Follows Gold Waves

THREE outstanding gold discoveries have spurred civilization on during the past 500 years. The first was in 1520, when Spaniards discovered the precious metal in South and Central America. This resulted in the conquest of the new world. The second was in 1850, when the metal was mined in Australia and California, resulting in colonization in these two areas. The third came with the finding of gold in South Africa and Alaska about 25 years later and caused a similar "boom."

This Model Cottage Makes

This attractive little cottage replaces the ugly black mail box and adds a touch of individuality to your home.



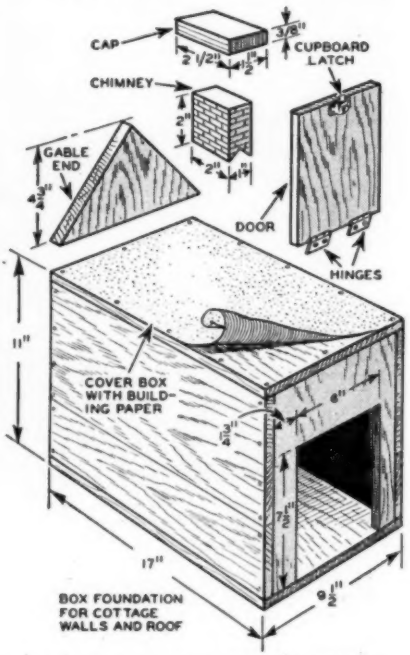
The framework platform for the cottage to rest on is made as the above diagram shows, leaving a framed space in the center just large enough to fit over the post support.

IF YOUR summer home or year-round residence is on a rural delivery route, or if you have city delivery and receive magazines, newspapers and fourth-class matter for which standard mail boxes are inadequate, set up a cottage box on the porch balustrade, on a post beside the front steps, or at the roadside. It will add individuality to your home.

Whatever type of building you select for the model, the start may be a box of approximately the dimensions given in the accompanying diagrams. This will form a foundation for the walls and roof, and can be made of ⅜ inch boards.

Knock it together as shown and when you have completed the box cover it with waterproof building paper.

Cut out a doorway in one end and make a door to fit, hinging it at the bottom, as shown. Screw a cupboard catch to the top of the door and a latch pocket in position to engage the latch.



The cottage is built around an oblong box which serves as the walls and ceiling. After doorway has been cut out of one end, box is covered with water-proof paper, as shown.

With the foundation box completed, frame the roof. If it is to be a gable roof, make a pair of gable ends and nail these to the box at the ends. Then cut the roof boards long enough to form two inch projections, and nail them to the edges of the gable ends.

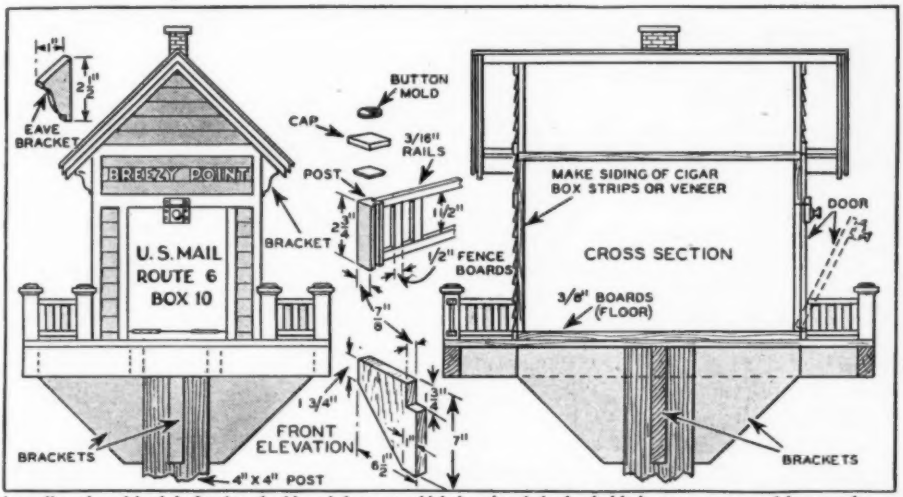
Imitation Brickwork Chimney

Shingle the roof with green asphalt roofing strips about 1" inches wide. The chimney is made of a wood block the size shown. The best way to imitate brickwork is to make horizontal saw cuts with equal spacing, then vertical joints with the end of a screw driver. Paint the block red, and when the paint is dry, rub white into the joints.

Trim the outside of the cottage with strips ¼ inch thick and ½ inch wide, forming panels above, below and between the windows and doors. Then cut beveled siding of narrow strips of cigar-box wood or veneer, and fit between the trim strips.

Paint the siding green and trim strips and door white. Letter "U. S. Mail", route and

Unique Roadside Mail Box



A small cupboard latch is fitted to the hinged door, on which is printed the boxholder's name, route and box number, as shown in drawing above. The siding is made from either cigar-box strips or veneer and fits between the trim strips.

box number on the door with black paint.

The window frames may be indicated on the glass with black paint or actually built in.

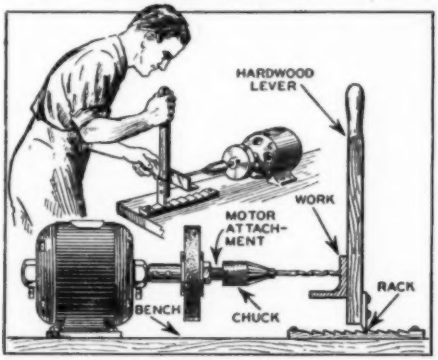
Build a platform for the cottage to stand upon as shown by the plan, making a framework of 1x2 inch strips, with a space framed in the center to admit the top of the support. Cover the framework with boards ⅜ inch thick or thicker. Four wooden brackets are needed to complete the base. Cut these of the shape and size shown, and when the post support has been set up, fasten them to it and to the under side of the platform.

Secure the cottage to the center of the platform. Then prepare the fence posts as shown above. If you groove the sides of the posts to take the ends of the rails, and one face of each rail for the fence boards to fit in, you will find it easier to assemble the pieces.

Finish the posts with square caps, and with button molds tacked to the tops. Paint the fence boards green and the posts and rails white.

If the support is to be set in a concrete footing, soak the end of the post in water first so that it won't swell and crack the footing after concrete has set.

Work Held Against Motor Drill by Simple Rack and Lever Attachment



Pressure is applied to the work by the muscle power exerted against lever, which is adjusted in proper notch in the rack.

THE drill chuck and emery attachment for small motors makes a useful piece of home shop equipment but is difficult to use because the work must be pushed against the drill with considerable pressure.

The idea of the device shown at the left is to apply the pressure by leverage and afford the work a solid backing.

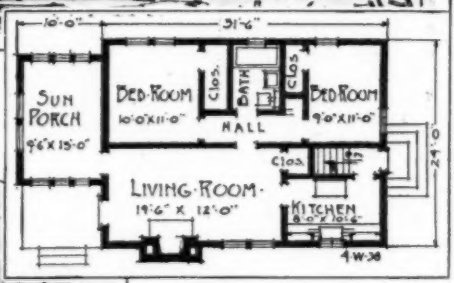
A rack is made of a piece of iron bar ½ inch square and about 8 inches long. A series of notches ¼ inch apart are filled in the top side of the bar, which is fastened to the bench. A 14 inch lever is made of hardwood 1 inch thick and 1½ inch wide. This lever is provided with a catch which engages the notches in the rack. The work is placed in front of the lever and pressure applied. The notch used depends upon the thickness of the work and the length of the drill employed.

"...And I Also PROMISE to

Offering the last word in economy, house No. 4-W-38, shown above, is featured by a sun porch to provide virtually outdoor sleeping facilities. Fireplace is inside feature.

by MAURICE I. FLAGG

Young couples who want to build a home of their own but who are compelled to economize, can't do better than to give careful consideration to the ultra-economical houses described here. They don't strain the pocketbook and they're "homey" as you want a house to be.



Here is the floor plan for house No. 4-W-38. The house looks attractive in stucco but can be finished in brick.

With the back door equipped with a grating as shown above, the housewife need have no fear of intruders who are bent upon gaining entrance.

OF ALL the promises by June grooms to June brides the promise to build her a house, a little love-nest of her own, may be a tie that binds tighter than a wedding knot.

During June an army of young folks will march to the altar and solemnly promise to trust, honor and perhaps obey. Suppose each wedding ceremony was modernized to include the words, "and I also promise to build her a house." What a grand and glorious home building revival we would have the next six months.

Everyone knows what our government is doing to make money available for home building. No one can argue that building materials, labor and home equipment are not on the bargain counter. In fact, it's "home cheap home time" and the opportunity for newlyweds.

Many a young couple is faced with the necessity of building on limited funds. They can't afford a large house. They don't want one too small. A love-nest that can grow as funds permit and conditions demand is the ideal house for most brides and grooms.

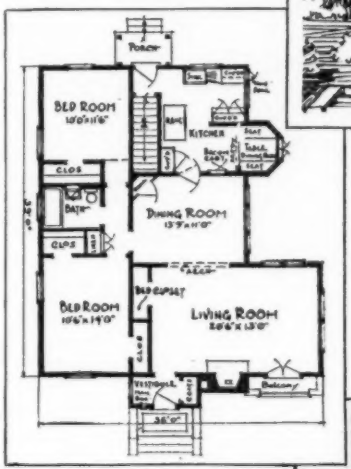
That's the reason I am showing the two houses selected for this issue. As homes for newlyweds they are moderately small, inexpensive to build, and at the same time offer possibilities for future enlargement.

BUILD HER a HOUSE"

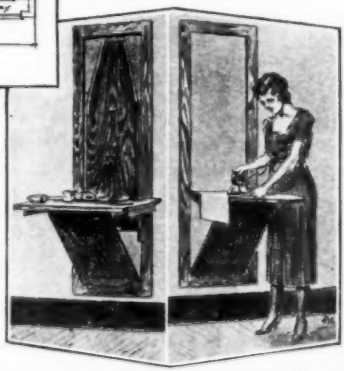
HOW TO GET A BLUE PRINT AND TWO PLAN BOOKS

A one-sheet blue print of any house appearing in Modern Mechanics and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, "Homes for Newlyweds," containing 32 of the latest ideas for low cost homes in all styles, and "16 Selected Homes for Lean Purses" containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics and Inventions Magazine, Minneapolis, Minn.

Though house No. 5-S-30, shown above, suggests Italian ancestry, it is in reality an ultra-modern American bungalow, having six rooms at five-room cost. An impressive fireplace is an interior feature.



Floor plan for house No. 5-S-30. For complete blueprints for this house or house No. 4-W-38, shown on opposite page, send $1.00 to Modern Mechanics Home Building Editor, 529 So. 7th St., Minneapolis, Minn.



Last word in convenience for small homes is afforded by this breakfast table which is convertible into handy ironing board in a second.

Externally you would judge house No. 4-W-38 to be considerably more costly than $5000. Yet that was the cost range by builders more than two years ago. With today's low level of prices that figure may be bettered.

The house has many flexible features and economies. In the first place you can build it on a lot as narrow as 35 feet. That means with the sun porch to the front. A corner property would be ideal.

The sun porch may be omitted and built later. A door opening from the bedroom onto the porch will provide sleeping porch facilities. There are two good bedrooms, a "wife saving" kitchen, a generous living room and a full basement. By slight alteration another bedroom can be added to the rear of the house at some future time.

A fireplace is an inside feature and the common brick chimney painted white is a decorative exterior feature. Construction is frame, wide siding painted white, shingle roof of either wood or composition and green blinds. The house will look well in stucco and can be built of brick if preferred. It's a stock job as far as possible, which means less initial cash outlay. An ideal little house for newlyweds.

Plan No. 5-S-30 offers six-room service at five-room cost. And the cost more than three years ago was something less than $6000, which means today at least 25 per cent less.

The style suggests Italian ancestry. In reality it is a modern American bungalow of the newer kind and one of the most popular of all the tested houses appearing in MODERN MECHANICS AND INVENTIONS magazine.

The living room contains a specially planned bed closet, thus offering what amounts to third bedroom service without the expense involved to build an extra room. That's a saving of between $500 and $1000 according to bed manufacturers. Note that the bed closet is placed conveniently near the bathroom, which means that members of the family or guests may enjoy as much privacy

(Continued on page 184)

Your Handwriting Analyzed Free

According to Mr. M. N. Bunker, famous handwriting expert, if your "g's" loop gracefully as in the upper specimen, you desire variety and change and should never settle down to routine job. "G's" made as in the slanted specimen denote adaptability to detail work. The lower specimen indicates vivid imagination and ability to write good advertising copy.

TO Mr. M. N. Bunker, famous handwriting expert, the letter "g" is one of the most revealing of the entire alphabet. The reason for this, he says, is that so many important character traits may be diagnosed by merely glancing at that letter in a page of handwriting.

For example, in the top specimen above you have a "g" which loops far downward in a graceful slant. This fact indicates a love for variety—a constant seeking after change. The person who makes this kind of a "g" should be warned to keep away from routine or detail work.

The fact that he makes his "g's" in this manner shows that he would never be satisfied doing office work. He desires travel and constant shifting of scenery about him. He should strive toward one objective.

Small Loop Reveals Knack for Details

The center specimen above (set obliquely) tells an entirely different story. These "g's" are very small and the loop protrudes only a very short distance. The person who writes like this would do well to get into some kind of detail work. He does not desire change and is very well satisfied doing the same tasks day after day, progressing slowly but surely. He will not seek travel, but finds his pleasures in the things that are around him.

The "g's" in the lower specimen are made in much the same way as those in top specimen but there is this distinct difference: They do not come down in a graceful, swinging loop. Rather, the loop is wide and ungainly. This fact indicates a vivid and exaggerated imagination.

Such a person, in telling a story, will exaggerate every detail, and when he is through with the story he will have made something entirely different out of it. He loves variety, but in seeking it he will be ruled by his vivid imagination and guided by his unconscious desire to overstate.

People who make such a "g" as that shown in the top specimen should succeed in newspaper work. They also make good salesmen and world travelers. On the other hand, if you make your "g's" like those in the center specimen you should get a position in an office as a bookkeeper or stenographer and stay away from newspaper work or selling.

If you find your "g's" are like those in the lower specimen, try to land a job with an advertising company writing copy and promotion features; but try to be less ruled by your vivid imagination.

Your latent powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, self-addressed envelope, together with a specimen of your handwriting to M. N. Bunker, care of Modern Mechanics and Inventions, 529 So. 7th St., Minneapolis, Minn.

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JUNE

A FAWCETT PUBLICATION

Screen Play

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If your newsdealer is sold out, send 10c in stamps or coin to SCREEN PLAY Magazine, 529 South Seventh Street, Minneapolis, Minn., and a copy of June SCREEN PLAY will be sent to you at once.

Phantoms of the Air

(Continued from page 50)

double bow so often seen in summer showers. The tiny drops of a fog (much smaller than raindrops) produce the white "fog-bow." The sun's reflected image on a smooth sheet of water sometimes produces a rainbow in the sky that intersects the one formed by the sun itself. A rainbow formed by the moon is usually too faint to show colors, though an exceptionally bright one is distinctly colored.

Water drops in fleecy clouds produce the diffuse ring around the sun or moon called the "corona," which is generally reddish or amber-colored but may show several other colors. While the rainbow is due to reflection and refraction, the corona is caused by diffraction. A large variety of corona, sometimes seen after volcanic eruptions, is due to fine dust in the air and is known as "Bishop's ring."

Similar in appearance to the corona is the "glory"; a colored ring seen around the shadow of the observer, or of his head only, cast upon a cloud or fog bank. Such a shadow, with or without the glory, constitutes the "spectre of the Brocken," often seen from mountaintops and from aircraft. Whenever the sun is low on one side of a mountain and a wall of mist arises from a nearby valley on the other, the mountaineer is likely to see his shadow on the mist.

If the latter consists of fine droplets of approximately uniform size, the colored rings will probably appear, and occasionally there is also a white fog-bow outside the glory. On account of overestimating its distance, the observer often wrongly supposes the shadow to be of colossal size, and it is commonly so represented in drawings.

The visibility of the sunbeams that stream through chinks in the clouds, the foliage of a forest, or small windows of buildings depends upon the presence of mist or dust in the air. Such beams extending downward from the sun give us the familiar spectacle described as "the sun drawing water"—though no such process is actually involved—while after sunset or before sunrise they often extend upward in fanlike sheafs of pink against the blue sky, and are called "crepuscular rays."

Various optical phenomena of the atmosphere due to the effects of ice crystals on the light of the sun or moon are known collectively as "halos." They include luminous circles surrounding the luminary or passing through it, sun-pillars and moon-pillars, sundogs and moondogs, luminous arcs in a variety of positions with respect to the luminary, and so on. Some halos are colored, others white. Each has a definite location with reference to the source of light, as shown in one of the accompanying drawings, which includes most but not all of the known varieties of halo.

These phenomena result from the refraction or the reflection of light, or from refraction and reflection combined, and their diversity is due to certain differences in the shapes and positions assumed by ice crystals in the clouds or in the lower air. Some kinds of halo are common, some are rare, and some that are theoretically possible have never been observed.

When several varieties of halo are visible at

Phantoms of the Air

the same time, the combination is called a "halo complex." Such sights are fairly familiar to polar explorers. In our latitudes they are most exceptional, but one of the most remarkable displays of this kind in the history of science was visible, in different degrees of development, over the eastern United States on November 1 and 2, 1913. Of the hundreds of thousands of people who, on that occasion, saw the sky filled with marvelous patterns of luminous arcs and circles, how many could have named the different features of the display—or even knew that all these wonderful things were halos?

Mechanical Cues to Direct Animals

(Continued from page 64)

Rennie Renfro, owner and trainer of more than 100 canines, works his dogs almost exclusively in Metro-Goldwyn-Mayer's all-barkie pictures. Travesties of important pictures they have made include "Trader Airedale," "The Big Dog House," and "The Two Barks Brothers."

What makes dog actors act? Kindness and hamburger for the most part, according to Jules White and Zion Myers, the clever young directors who created the idea and who have directed the series, developing it until today a dog comedy is actually easier to direct than one with human actors.

"As the first step toward training a dog," says Renfro, "teach him to play with a ball, and when he has a liking for that, then start on some simple trick like 'sitting up,' using the ball and bits of hamburger as rewards. Some dogs will do more for something to eat—some for a chance to play ball," Rennie declares.

"The first idea is to build up an understanding with the dog—for dogs can understand you when you tell them something, as soon as you have their confidence. To train a dog, a fellow has to know at least as much as the dog."

To teach small animals to somersault, a special harness is made, to which is attached two straps, one fastened to a ring on a post about three feet off the ground, the other held by the trainer. At a signal, the animal leaps off the ground and the trainer simultaneously pulls the strap taut, so the animal automatically turns in the air. Once the animal masters the body turn precisely, the harness and straps can be dispensed with.

Every trainer of dogs knows that "mutts" are far easier to train and much more tractable than are pedigreed dogs. Also, the mongrel is cleverer by far—possibly because thoroughbreds, raised more in luxury, have never had to sharpen their wits by hustling for themselves in emergencies. This "hustle" is bred through generations in the mutt. A smart dog is one who has an "edge" on the others in general intelligence which will enable him to master difficult routines in training.

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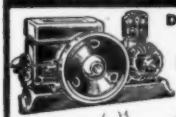

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Magnetic Oddities of Our Globe

(Continued from page 80)

direction. At London, for example, on account of the secular change in declination, a compass needle, which pointed 11 degrees east of north in 1580, pointed 24 degrees west of north in 1812, and since that time has again shifted to the eastward so that it now points only 13 degrees west of north.

Besides secular variations there are small changes with the season of the year and with the hour of the day. In some parts of the United States the diurnal change of declination averages a quarter of a degree in summer, but is smaller in winter.

Much more striking are the sudden brief disturbances of the earth's magnetism known as magnetic storms. These often occur almost simultaneously over the whole globe and are not connected in any way with the storms of the earth's atmosphere, but they tend to occur at times of great activity in the sun, as manifested by the appearance of big sunspots. They are also, in many cases, accompanied by widespread displays of the aurora and by violent earth currents, which interfere with the operation of telegraph lines.

How Magnetic Storms Affect Radio

Apparently through affecting the height of the Heaviside layer, magnetic storms likewise affect the paths of radio waves, causing stations ordinarily not receivable to come in strong and others ordinarily easy to get to become inaudible. Trans-Atlantic broadcasting is sometimes badly demoralized by these storms.

A few generations ago measurements of terrestrial magnetism appeared to be of little practical or scientific value except as a means of correcting compasses. Nowadays, however, the results of such measurements are applied to so many purposes that if, owing to the increased use of such devices as the gyrocompass and the radiocompass, the old-fashioned magnetic compass should become entirely obsolete, it would still be urgently important to continue the magnetic survey of the globe.

Observations of the earth's magnetism throw light on phenomena of solar physics and of atmospheric electricity. Secular changes in the magnetic elements are probably related to actual movements of material within the earth's crust, and thus magnetic measurements promise to become a valuable means of investigating the earth's interior. On the practical side, detailed magnetic charts of certain regions furnish clues to the location of ore and oil deposits and are therefore extensively used in the new art of geophysical prospecting.

Magnetic measurements are now made continuously at about 70 observatories in different parts of the world and intermittently at thousands of temporary stations, each of which is reoccupied at intervals of a few years in order to take note of the changes occurring at these places. In the United States magnetic surveys are kept up-to-date by the Coast and Geodetic Survey, while the Department of Terrestrial Magnetism of the Carnegie Institute serves as a connecting link between the official magnetic surveys of all countries and conducts its own surveys in the less civilized regions of the earth as well as on the ocean.

Keep Well Though Vacationing

(Continued from page 101)

have an irritating effect on the skin, somewhat like nettles. Some caterpillars have a spine that is very irritating and causes a lot of hard thoughts when it climbs onto laundry, bathing suits, shoes and stockings. Shirts having caterpillar hairs bring hours of keen discomfort. The remedy is a two per cent solution of sodium bicarbonate followed with a ten per cent ichthyol ointment.

Snakes, like spiders, have a reputation they do not deserve. It is true that some are poisonous, but the majority are not. If you suddenly come upon a snake, do not get excited—stop and inspect it to determine if it is a rattler, water moccasin, copperhead or other poisonous kind.

If it is one of these, and the country is not densely populated, let it go unmolested. It probably will pass you by if you do not force it to defend itself, since snakes are not willing to use up their valuable poison on everything they meet; they strike only when hard-pressed.

But if you happen to offend a snake unintentionally and are bitten, proceed at once to apply first-aid, or have your companion do it. A tight bandage between the wound and the heart will prevent spreading of poison in the body. Suck the poison out of the wound with your mouth, and spit it out. Snake venom is not harmful to a healthy mouth.

Then get to a doctor as quickly as possible. He probably will give you a shot of anti-venom. If you were mistaken and the snake was not poisonous, the anti-venom will make you sick, but otherwise will not hurt you.

Poison ivy still remains a frequent vacation companion. You will avoid much displeasure by preparing for it in advance. From your druggist obtain a five per cent solution of potassium permanganate. Then if you get the irritating oil from poison oak, ivy or sumac on your skin, wash gently but thoroughly with soap and water and swab the affected places with cotton saturated in the permanganate solution. This will cause a stain that later can be removed by generous use of soap and water.

Dr. James B. McNair of the Field Museum in Chicago has devised a wash to prevent ivy poisoning. It consists of a five per cent solution of ferric chloride in a half-and-half mixture of glycerine and water. Apply it to exposed parts of the skin before going where poisonous weeds are growing. Any druggist can prepare this or any of the solutions for you.

In selecting cans of beans or soup or anything else, inspect the containers to see if they are bulged out at the ends. If they are, it means that the contents have spoiled and that the gas produced by decay has pushed the metal outward. Do not accept such deadly foods when offered to you by a grocer.

Finally, observe the physician's precaution to avoid undue fatigue, which lowers your body resistance and makes you heir to the thousand and one ills that are standing always just in the offing. If you observe this and the other precautions, you can laugh at your neighbor who returns from his annual two-weeks-with-pay, more nearly exhausted than he was before his vacation.

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Science Calculates Span of Life

(Continued from page 95)

the coat into a nearby pile of hay. The hay, a barn, the milk truck, four automobile trucks and two wagons were burned. Not since Mrs. O'Leary's cow started the famous Chicago fire has an animal figured in so odd a burning.

A policeman in Exeter, England, carrying cough drops loose in his coat pocket was burned when the drops exploded and set his clothes on fire. Chemists found the drops contained chlorate of potash which had been ignited by rubbing against the rough wool clothing.

Even more remarkable, considering the mathematical odds, a Frenchman was struck five times by lightning during his lifetime and lived to die in bed of pneumonia. That was so odd that actuaries computed the chances of any one person being struck five times by lightning. It was found that the chance of any one person being struck five times during his life is about 1 to 2,000,000,000,000,000,000. Or putting it another way, the average person would have to live two thousand million billion lifetimes to have such an experience.

For real strangeness, the palm undoubtedly would go to the accident which happened to P. Wiggins, of Scott City, Kansas, an aviator who was bitten by a rattlesnake while flying in his plane nearly a mile above the ground. Probably the snake crawled into the plane while it was standing in some field, and was angered by the noise after being revived by the heat from the engine. Wiggins threw the snake out and made an emergency landing in time to get first aid at a nearby farmhouse.

The air mail has three or four cases on record where night mail pilots have sighted burning farmhouses, swooped down, gunned their motors and awakened the family with the din. At Long Beach, Calif., a flyer noticed a bather in trouble, swooped down and threw a life preserver to the swimmer, then went for help.

A Brooklyn, N. Y. man awakened during the night by the telephone, answered and found the caller had the wrong number. Smelling gas while on his way back to bed he investigated and found all the rest of the family unconscious and near death from leaking gas fumes.

A man at Hillsdale, Mich., was crossing a street carrying a spare tire when an automobile hit him and knocked him twenty feet. He lit on the tire and escaped with minor bruises.

A building construction worker in New York fell seventeen stories without injury. He fell off at the 26th floor, grabbed a cable on his way down and swung in at the ninth floor level.

In Newark, N. J., an electric light company lineman fell off a high pole and landed almost beside a passing ambulance, whose surgeon gave him emergency attention and saved his life.

The records are full of such lucky accidents, but, if you really want a dangerous job and one full of thrills you can safely rely on the insurance man's list of N.I.R.'s as a guide. Not everybody can be lucky.

Adventures of Barnstorming Blimp

(Continued from page 88)

ed us at St. Louis but the wind carried us far off our course."

A few nights later the crew was camped in apparent safety on the ground at Springfield, Mo., when sleet began to fall. By daylight ice on the bag was beginning to weigh so heavily that the wheel dug eight inches into the mud. Gusts of wind swung the ship from one side to the other. Snow fell and with the increasing weight the tail had sagged eight feet and was dragging in the mud.

"Despite all our precautions," Major Wadsworth says, "the bag became so heavy that the men could not hold it out of the mud.

"The bag became so heavy that it keeled over on one side and lay there, like a sleeping elephant, with the stabilizer resting on the ground. The men pounded the ice with their hands, hoping to shake it off. They knocked off enough to permit the blimp to lift up on its wheel again, then it collapsed on the other side.

"Early in the morning the Springfield fire department, in response to our call, came out to the field. At noon the temperature raised a few degrees and for an hour the firemen sprayed water in powerful streams on the sides of the bag. Soon ice began to fall off in large blocks. The bag righted itself and we were able to get safely under way."

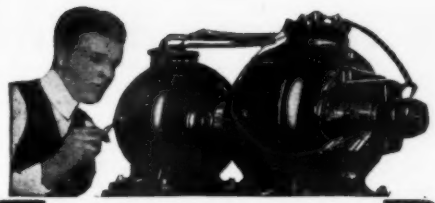
The blimp was hitched to its portable mooring mast everywhere the barnstormers stopped. When they got to the difficult part of the flight and in the longer hops over the mountains, across the desert or plains, and particularly where there were bad roads, Major Wadsworth found it was unsafe to transport the mast in an automobile. He chartered an airplane and sent it ahead by air each day.

They moored the airship at night and in the morning, after taking off, the ground crew dismantled the mast, loaded it into the plane and sent the ground officer and one assistant to establish that night's base, possibly 200 miles ahead.

On one occasion, after the mast had been set up at Lordsburg, New Mexico, the blimp made a forced night landing at Deming, New Mexico, some 50 miles distant. A member of the crew phoned to the advance officer, instructing him to dismantle the mast and send it back to the ship. After two hours drifting, a safe landing was made.

The blimp pilots encountered some very rough weather flying through the mountain passes. The first two or three hours out of Del Rio, Texas, were the worst, especially over the mountains to Moffet. On the last pass entering Moffet Lt. McCracken valved helium several times in order to get over the mountains. Fully 4,000 feet were dumped on this one flight.

After crossing the Texas mountains the blimp sailed serenely across the desert, but when 600 miles short of its goal—the Pacific—the right engine failed, and the gray bag limped across Arizona and the mountains of California on one engine, finally leveling off at Lindbergh field, San Diego, where repairs soon enabled the barnstorming bag to continue up the western slope of the Rockies to its destination at San Francisco.



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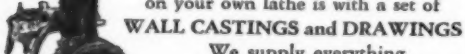

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Secrets of Winning Motorbike Races

(Continued from page 106)

finally go into a turn fairly fast, broadside clear around into the next straightaway, and have control all the way. And remember—if at any time the rear end slides around too much and heads you toward the inside of the track—ease off just enough on the throttle to enable you to hold your direction and hold your broadside."

Now for the motorcycle itself. Amateurs in the United States may enter motors as large as 45 cu. in., like the Indian or Harley 45 motorcycles, provided they have side valves and not overhead valves.

In other words, if you own a regular 45 cu. in. job, or a "37" or a "21" you may, if you wish, fit this motorcycle for competition work, by following these simple rules:

First. Strip it down—i.e., remove all unnecessary parts, such as headlights, generator, tool box, front mudguard, all electrical fittings, but leave a short section of the rear mudguard as shown in accompanying photos.

Second. Fit "drop bars," which you can make by bending and cutting a set of old handlebars, so that when sitting on the machine you will be leaning, or crouched down, over the tank with your head almost over the front of it. (See photo of amateur rider in racing position.)

Third. Do not attempt to accomplish any successful slides or broadsides with balloon tires or tires which are larger than 3" in section. 26"x3", 28"x3", or regular racing tires on racing wheels, 28"x2½", pumped up to good hard pressure, to give you better control.

Fourth. By all means fit a cutout button to the magneto or distributing system so that this button will be located under your right thumb, and connect your throttle to the left handlebar, so that the hand which is on the inside of the turn when you are broadsiding will be on the throttle, ready to "ease off" or "turn on" power to preserve the direction of your broadside.

Fifth. For dirt track racing, no saddle springs are necessary. Fasten the saddle down solidly to the frame, making it as low as possible, and just far enough back so that your arms are fairly straight when in riding position.

Sixth. To enable you to hold your riding position while broadsiding, a "knee iron" should be fitted so that it will come directly above your right thigh, and so that you can brace the lower section of your leg between this padded "knee-iron" and a foot rest which should fit the ball of your foot.

Seventh. Of course, the motor must be turned to the top notch efficiency with compression raised, higher valve lift, and everything in top notch condition.

Eighth. The gearing is most important. You will have to try broadsiding a special dirt track racer on your own ground before you can determine the gear. The motorcycle should always be driven in high gear and should be geared low enough so that rear wheel will spin easily when broadsiding to make the stunt easier.

Like every other sport or enterprise where skill is required, the art of successful dirt track racing depends upon the preparation of both man and machine and the practice and effort put into the game.

Microscope Magnifies 17,000 Times

(Continued from page 107)

spores. These filmed life histories of man's most deadly enemies, Rife made not only with his own microscope, but with a motion picture camera which he developed, which may be set at a certain speed, and left to follow the germ through its entire life, about 72 hours being required to make such a picture.

When this film is completed, it may be thrown on a screen to such size that the microbes are several inches long, which microscopic parasites, such as the hookworm, appear two or three feet in length. The great advantage of this is that physicians, surgeons and laboratory workers may study these deadly creatures at their leisure, and without the strain of keeping their eyes fast to a microscope. Details, such as the filaments of typhus germ, and the teeth of the hookworm become plainly visible in the motion picture, whereas they do not appear at all in the best of research microscopes.

The "stage" on which Rife makes his microbes —for he breeds and rears the deadly germs by billions—is made of the purest of quartz crystal and is automatically heated and cooled, with thermostatic control, and also control of moisture, and of oxygen quantity. On it he gives the microbe-movie actors exactly the conditions in which they flourish best, with the result that they show complete development and utmost activity.

The marvelous new microscope is composed of six lenses, cut from the purest of quartz crystal by German workmen in Germany. These lenses are completely and solidly immersed in pure glycerine, in a brass barrel, or tube. Thus, there is nothing whatever in this tube but glycerine and lenses, no air, no vacuum. The secret of the great power of the microscope lies in the lighting. Rife takes the beam from a 2,000-candlepower lamp of his own design, and polarizes it, selecting the pure colorless light (white to the human eye) and playing it under, over, around and through the field, also of pure quartz crystal, on which the object being studied rests.

"The making of the lenses homogeneous in glycerine," said Dr. Rife to the writer, "gives the effect and results of one solid lens, eight times more powerful than any now in use."

The "forceps" with which Dr. Rife isolates, picks up and handles a bacterium less than one-125,000th of an inch long, are made from the half of a human hair, split lengthwise. The half hair is again split, part way, so that when the split end is pressed down on the field, the halves part. Then, when it is lifted, these halves close, picking up the individual germ. The "knives" with which he dissects germs, are made of quartz crystal, and are themselves almost microscopic. Both "forceps" and "knives" are operated by small thumbscrews on long arms, working through universal joints.

With this instrument, he has found that the average disease germ weighs one-184-trillionth of an ounce, and is one-125,000th of an inch long. He has learned by actual measurement of thousands of moving germs, that they maintain high speeds. "If the speed of one of them could be transferred to man," he said, "that man would travel, on his own feet, more than 500 miles an hour!"

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A Tailor-Made Trunk for Your Car

(Continued from page 160)

shown in the illustrations. Here it will be noted that the forward corner trim is made from two pieces, the lower piece running down and being used to cover the joint which was necessary when the cover of the trunk lid was fitted. Note that in all cases the covering material is pulled in around the edges of the lid and trunk case and tacked with copper tacks on the inside.

On first thought it might seem impossible to cover a curved trunk lid such as this with one piece of material, but by stretching the fabric from end to end a natural lap will form at the forward corner and this material is cut at the point covered by the leather corners, as suggested above.

Piano-Type Hinge Used

Assemble the lid to the case and proceed to hinge. Use a chromium-plated piano type hinge the full length of the trunk (this may be in several lengths) and fasten to the trunk and lid with nickel plated oval head brass screws. In order to prevent water going through this hinge line, which must be on the top in order to have the trunk open wide, the hinge joint has to be on the top.

This, of course, means that it is most difficult to weatherproof it. Make up an eave trough strip to be of the same material used for the covering of the trunk. Note that one side of this strip of material, which is ¼ inch wider than the piano hinge, has holes punched in it to match the holes in one hinge leaf, while the opposite side has elongated holes punched in it. When screwing on the hinge, allow the eave trough to lie flat under the hinge, assembling all snug.

Next loosen the screws on the side having the slotted holes, about two turns of the screw, making certain that all are free, then open the trunk and this will stretch the eave trough. Tighten the screws before closing. This eave trough will run the water to the end of the trunk and allow it to drip without going into the trunk.

The next step is to fit on the chromium plated fasteners which in the case illustrated are suitcase or trunk hasp locks which may be secured from the hardware store. If you like you may further decorate the trunk by using trunk straps. You will naturally want to attach trunk handles on the ends. These may be made up by a harness maker or secured from the supply house.

Lining Attached With Casein Glue

The final job of finishing is to remove the lid from the trunk, remove the rabbet or batten strips around the lid and proceed to line the entire trunk with a suitable color of print oilcloth. The lining is attached to the trunk with casein glue and a few copper tacks as needed. Batten or rabbet strips are covered entirely, the joint being at the point where the strip is attached to the inside of the trunk with a screw so that it does not show.

By using a little care and thought on the design of the trunk and working it out carefully, the finished job will afford a great deal of satisfaction insofar as its appearance is concerned. Its use, of course, is the prime consideration, but the

A Tailor-Made Trunk for Your Car

appearance of the trunk will match the best design and finish. Size of the trunk illustrated can well be appreciated by the consideration of the picture, which shows three fifteen-year-olds seated in the trunk. The fact that the lid is set on as shown makes it easy to place in the baggage, no high lift being required.

If the builder will remember to lay out the ends all in full scale, exactly as desired, on the cardboard as suggested at the beginning of this article and then use this pattern when working all parts to it for those dimensions which should fit it, the task of building the trunk is made a real pleasure and the appearance of the finished product is assured. The actual increase in difficulty in working out a curved lid and back in a trunk of this design is very little indeed over that of building a purely square trunk. The satisfaction of having a "professional looking" job pays big dividends.

"Science Rackets" of the Desert

(Continued from page 74)

of desert life, at reasonable prices to zoological gardens and museums, and at considerably higher prices to individual collectors. But their most profitable "game" is the sale of so-called tame snakes of non-venomous varieties, and the two unique lizards—the horned toad and the chuka-wallah—to queer-minded women as pets.

Will Renard, a "collector" of note, carries a basket of gopher and king snakes, harmless, which he claims are trained, though as a matter of fact the only snake which can be trained at all is the deadly cobra of India. These snakes sell for $5 to $25, depending on the ability with which Will and his fellows can convince the tourists as to the reptiles' training. The spiny lizard, better known as horned toad, equipped with a tiny silver collar, chain and pin, brings $2.50. This rather docile lizard may be caught free for a little effort along almost any desert road, and the collar costs probably ten or fifteen cents.

One of the largest and most profitable rackets on the desert was scotched recently by the national government and the state of California. This was the sale of "city lots and acreage" around the Hoover dam site, on both sides of the Colorado river. Land which cost the promoters about 60 cents an acre, was offered in nation-wide advertising at $50 to $200 an acre. It was and is absolutely worthless for anything except stone and sand quarries, and is too far from transportation for this use.

Hotels, bungalow camps, auto camps, even tent-sites, sell and rent on the desert for three to ten times their actual value. The writer has paid $1 a can for tomatoes, normally selling at ten cents, but held at the higher figure by a roadside racketeer on the desert. The man with a well or spring gets 25 to 50 cents a bucket for water. Scores of Indian squaws, under control of a white man, weave hundreds of baskets, in cheap and poor imitation of those their mothers and grandmothers made, but selling for $2 to $10 each, though the women actually received 25 to 50 cents a day for their work.

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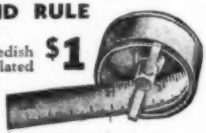

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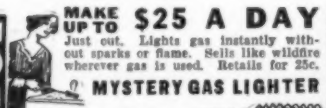

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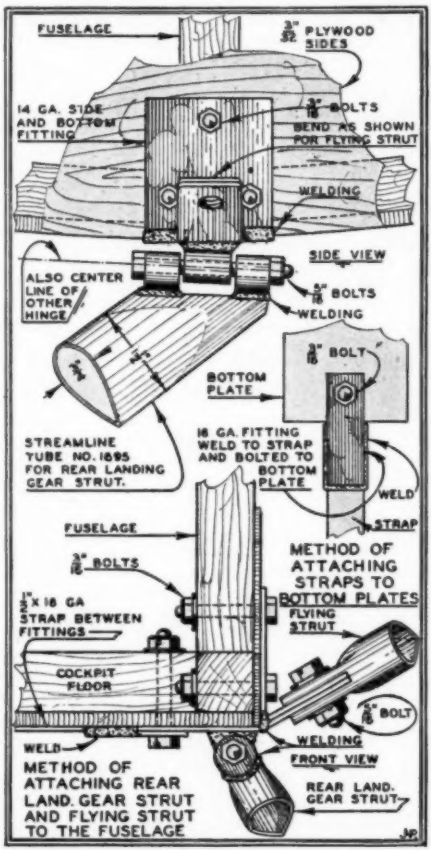
Plans for the Pietenpol Sky Scout

(Continued from page 147)

Minn., and enclose postage. This is important as I answered 2000 letters last year on the A job.



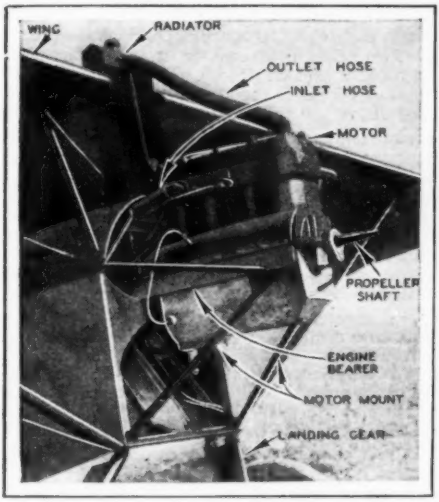
There are the details for the fittings used on the fuselage end of the new V-type Pietenpol landing gear. All bolt holes must be snug fits.

Here are some of the salient figures that readers will be wanting in connection with the motor and the business end of the ship. The weight of the prop is about 12 lbs. The weight of the motor dry is about 185 lbs. The weight of the radiator is 15 lbs. The job holds four quarts of oil which weigh 7 lbs. and the cooling system holds 3 gals., or about 20 lbs.

I would say that this four is about 32 h.p. It turns a Lawrence prop 1500 r.p.m. and the government figures show that this prop requires 28 h.p. at 1400 revs. The model A will not turn this prop over fifty turns faster.

The propeller is 6 ft. diam. by 42 in. pitch and turns anti clockwise. This is a Flottorp prop and can be gotten from Sears Roebuck at $15.00. It will turn from 1650 to 1740 on the ground de-

Plans for the Pietenpol Sky Scout



This will give you an intimate glimpse at the salient points of the T conversion as used in the Sky Scout. The McCord radiator, bearing lubricator and other parts are shown as per drawings elsewhere in this series.

pending on the day. It cruises at 1600 to 1650 in the air and will turn 1850 in the air wide open.

The weight of the fuselage less cloth and metal fittings is 43 lbs. with turtleback and instrument board. The weight of the tail unit less cloth and horns is 9¾ lbs. Each landing gear V weighs 5 lbs. Shock struts weigh 3½ lbs. each. Weights of other components have been given in other installments.

With regard to the licensing of home-made ships. I have received about two hundred letters asking if this ship can be licensed, saying that their state law forbids anything but licensed ships to fly.

Now in the first place we have never tried to license one of these ships. We have, of course, identification marks. When you have your numbers on you can fly your ship anywhere in the U. S. as long as you do no commercial work. You can do, though, commercial work in your own state, such as passenger carrying, etc.

That is Federal law and about all that needs to be said on the subject. See Andy's Shop Mail Box next issue. So Long!

SKY SCOUT BLUEPRINTS FOR $4.00

A complete set of shop blueprints for construction of the Pietenpol Sky Scout, done up in large size for workshop use, can be secured for $4.00 from Modern Mechanics and Inventions Blueprint Department, 529 S. Seventh St., Minneapolis, Minn. These are genuine blueprints on tough paper. Their size makes it easy to scale off dimensions and they'll save much time and effort on the part of the builder.

A separate set of prints, showing airplane conversion of a Model A Ford motor, is available for 50 cents if you prefer to use this engine in the ship. Plans for the two-place Pietenpol Air Camper, using Model A motor (conversion shown on the prints) are available for $7.50 per set.

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"—I Promise to Build Her a House"

(Continued from page 169)

as though they occupied an independent sleeping room. Two other bedrooms on the first floor, a dining room, a breakfast nook in the kitchen, and a bathroom, complete the service quarters. There is space above for another bedroom and storage.

Interior features are an impressive fireplace with brick mantel, an arched opening between living and dining room, a china cabinet in the dining room and plenty of closet space.

Exterior treatment of the chimney shows set backs after the style of modern skyscrapers. This variation of line brings a touch of modernism into the external design. Colored tiles embedded in the stucco finish over the window openings add still more style.

Brick trim around the entrance door, a balcony with iron rail in front of French doors and brick steps are other features that give this house distinction. It may be built equally well in brick. In fact a plan No. 5-BV-20 has been prepared for brick exterior finish.

And that completes the description of the two suggested homes for newlyweds. They offer style, unusually low cost, and in many respects both are miniature mansions but well within the range of tolerably lean pocketbooks. Hope you like them. Remember, now is the time to build.

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New Inventions That Baffle Crooks

(Continued from page 44)

pitchers. Under the ultra-violet ray, the pitcher containing the dust speck appeared a brilliant blue, while the other remained unchanged.

Tear gas is automatically discharged at intruders who force open doors protected by a special lock invented by Charles Brand of New York. Forcing open the door releases a charge of gas which leaves the intruder blinded and helpless—an easy captive for anybody.

Police training methods overlook no aids of science in training prospective members of the force how to fight criminals. Large cities have elaborate police training systems. In New York, for instance, there is a shooting gallery where speed and accuracy with revolver, riot gun, and rifle is taught. At the end of this gallery is a metal movie screen.

On this screen is flashed an action picture of a policeman wrestling with two crooks. Motion is rapid—the bodies twist and squirm. The problem of the rookie is to shoot so that he hits the crooks, but not his fellow officer. Constant practice enables him to become proficient in this important art.

After the crook is caught, or suspects rounded up, the scientific mechanic still has work to do. Special turntables for viewing suspects, presenting every angle of the features; backgrounds on which distances are marked in feet and inches so that it is a simple matter to gauge a man's stature—these and countless other bits of equipment are used, depending on the ingenuity of the men who make them.

Criminals themselves are swift to turn to advantage inventions which can benefit them. That's why there's never any rest in the relentless warfare waged between crooks and the law. That's why, police officers say, there never can be too many inventions to baffle the crook. It is a fertile field for the experimenter, and one in which the inventor benefits not only his own pocketbook, but the welfare of the country.

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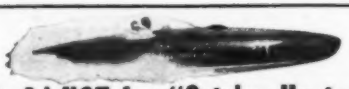

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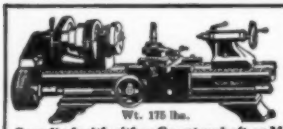

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The A-B-C of Small Boat Sailing

(Continued from page 139)

board" and the left side is named "port". Look at sketch 1. The boat is sailing close hauled with the sail to starboard and the winds striking on the port side. This is called sailing on the port tack.

Now suppose you wish to put about on the starboard tack. First make sure you have plenty of room to make the maneuver; your boat is making good headway and your crew ready. Ease off slightly so the wind strikes more abeam. Quickly put the helm down to starboard or "le'ward," as the sailors say. This snaps the boat's bow into the teeth of the wind and around so the wind will strike off the starboard bow. The sail will flutter while in the eye of the wind, but will immediately fill when the wind strikes it on the other side.

Stand ready to flatten down the sail as she fills and center the helm enough so the bow again heads near the wind, but off enough to fill the sail nicely. Sketches 2, 3 and 4 show how this change is made from port to starboard tack. All this is done in a very short period of time in a stiff breeze and you and your crew must be in readiness for quick action.

Remember in tacking (sailing close hauled on each leg) to keep the sail just beyond the fluttering point. A slight flutter at the "luff" next to the mast will indicate that you are sailing a bit too close to the wind to make best headway, and you should either flatten the sail a bit more or pay the bow off slightly so the wind will strike more fully on the canvas.

When tacking or reaching always keep the "mainsheet" or line to the boom in the hand or looped once around the cleat so it can be let go instantly should a heavy puff of air heel the craft over far enough to endanger capsizing. Never fasten the sheet securely, even in light air, as you never can tell.

If you will study the diagram on page 138 you will see just how tacking is accomplished and why it is done. Suppose the wind is blowing along in the direction of the shore. You want to sail parallel with the shore, without going too far away from land. Suppose for instance you start toward the lighthouse close hauled on the starboard tack. As you near the shore you put about on the port tack and continue out as far as you wish to go, then put about again on a second starboard tack and so on until the lighthouse is reached. Each tack is called a "leg".

Another trick of sailing that may enable you to change a course from running free into a reach or tack on an opposite quarter or take advantage of a shift of wind is the "gybe". **Never** attempt to learn to gybe in a hard breeze.

Suppose you are running nearly free before the wind and want to head around to port as quickly as possible. Look at 1 in the diagram on page 138. The wind is coming abaft the beam or nearly aft. You want to travel as in 3. Of course this can be done by hauling in the sheet and pulling the bow up and around to starboard until close hauled on a starboard tack, and then coming about to the port tack and easing off, but gybing will do it much quicker.

Put the bow slightly to port as in 2, at the same time smartly pulling in the sheet until the

sail is trimmed flat. The wind will immediately catch on the upper port side and slap the sail over to starboard and you will sail away on a port reach as in 3. But take care. Be sure of your spars and rigging and watch the swinging boom that it doesn't rap you on the "conk". This sudden swinging in a breeze tries out the entire rigging and is a strain on the entire boat and dangerous to the skipper unless he is alert.

Now a word or two about getting back to your moorings after the sail. You usually approach the mooring by either running before the wind or by tacking. When approaching by the first method you must check the boat's momentum before nearing the buoy or float or dock. The logical method is to sail by the spot and then come up into the wind, hauling in the sail as in tacking and approaching the buoy from the opposite direction on a tack.

Just before reaching your objective luff up right into the wind, slack off the sheet so the sail spills the wind and let the boat glide up to the buoy of its own momentum. If you are sailing close hauled on a leg and approach the buoy from that direction, simply shoot into the wind and slack off the sheet before you reach it. You will then be able to glide up to it as before. Of course when sailing on salt water or in a stream, the rapidity of the current must also be taken into consideration and allowances made for the additional drift or resistance of the current.

Here are a few don'ts and do's.

You cannot be too careful in a boat. Know your rigging, your boat and study the wind.

When passing under the lee of a larger vessel, cliff, or other blanketing object be careful when coming into the clear again. A sudden gust of wind may heel the boat over dangerously.

Steer clear of anchored boats, moving ships, etc.

Always keep the centerboard down when tacking or reaching to prevent drifting. When running free in gentle wind pull the centerboard up to gain speed. If in rough water keep it down to prevent "yawing" or zig-zagging which might cause the sail to gybe unexpectedly.

Don't allow ballast to lie loose in the bottom of the boat. Secure it so it cannot shift with any heeling of the hull or bucking in high seas.

Keep all lines coiled so they will not kink or foul when action is needed in an emergency.

Don't fasten the main sheet securely when sailing. Keep it so it can be released instantly.

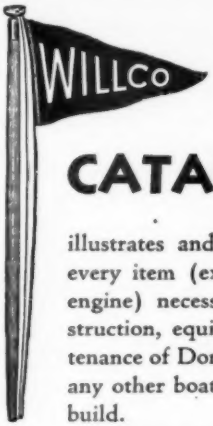
Don't sit too high on the windward rail in a fluky wind. A sudden lull might cause a capsize to windward. Better let the boat heel over more and be ready with sheet and rudder to right it if necessary.

Never put the boat's bow directly into the wind unless necessary. This will put the boat "in irons" (lose headway) and will cause a drift sternward that is often difficult to get control of.

Leave your anchorage with sail slightly slackened and slowly pull in the sheet to trim sail as the boat gets under way.

Always sail under reefs if the wind is too high for safety under full sail. Reduced sail will give better speed with extra safety.

Again—always be cautious, watch your course, watch the wind and bail out all excess water—it's poor ballast.



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Modern Methods Improve Tattooing

(Continued from page 85)

machine, which is used by nearly every tattooer today, the work is done very rapidly on all customers.

It sometimes happens that after a dragon or anchor or bathing girl has been neatly tattooed on a man's chest he changes his mind and decides that he would rather have a tombstone or a snake or a battleship. Our present-day science has not succeeded in solving this erasure problem very satisfactorily, for a tattoo mark is still a rather permanent fixture. Various methods are used to remove tattoo marks, but all of them leave a scar of more or less prominence.

Removing Tattoo Marks

Some tattooers inject acids or other chemicals into the skin and endeavor to bleach out the colors. Others peel or cut off layers of skin. But the most satisfactory method in this case is the oldest one—to cover up the old mark with a new design pricked on top of it.

This is frequently done in the case of boys and young men who have had their best girl's initials tattooed on their arm or over their heart. When that particular young lady throws them over, they come back to the tattooer and have a "T" made into an "F"—or perhaps cover up the entire initial with a gorgeous coiled snake or a smoking Vesuvius panorama.

There is no evidence that tattooing is dying out or is on the decline today. It has flourished for several thousand years, and the modern scientific tattooing instruments seem to have given it a recent boost. One of the largest manufacturers of these present-day tattooing instruments is Percy Waters, who lives in Detroit, Michigan, and who furnishes tattooers all over the world with the supplies needed in this trade.

In Waters' daily mail come orders from England and South Africa and Australia and the Orient. As a supplier of electric tattooing machines (of his own patented construction) and inks and needles and designs, Mr. Waters is confident that tattooing will never die out. He himself has been a tattooer for nearly a quarter of a century, and his correspondence keeps him in touch with tattooers in every part of the globe.

Lipstick Tattooed on Lips

A letter recently received by Waters from England reveals the fact that tattooers in that country are making progress in the field of beauty tattooing. Permanent lipstick is applied and rouge for the cheeks and stencilled eyebrows. Similar to this type of work is the art of covering up bald spots with tattooed hair and of concealing ugly scars with a trim little design of one sort or another. Beauty shop operators at the present time are seriously studying the possibilities apparent in this field. It may be within a few years' time that a generation of men and women will bloom forth with perfect complexions and perfect facial coloring at all times.

In this country, however, the most promising field for development today is found among fur breeders who need to mark their animals indelibly for identification, pedigree and age purposes. The large-scale fox ranches especially have found the electric tattooing needle an ideal instrument for this type of branding. Rabbits,

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Modern Methods Improve Tattooing

goats, dogs and chickens are also being marked in this manner.

Portable machines are supplied so that the rancher can go right out to his farms and mark all his animals himself without incurring a great inconvenience or great expense. The most common place of tattooing animals is on the inside of the ear where the mark will always be a positive means of identification and description.

Scientists also are finding new uses for this ancient art. The University of Wyoming, College of Agriculture, wrote to Waters not long ago to find out whether areas about one-inch square could be accurately tattooed on a living sheep's skin. They conceived this means of removing wool from such marked areas and studying it for fleece fineness and density.

Machines Make Tattooing Easier

Tattooers as a whole today are well content with their profession, due to the fact that the electric machine has made their work easier and more rapid and that new fields every year are opening up for their talents.

Occasionally some strange and unexplainable demands are made on the tattooer, as, for example, the customer of Waters who had him implant the outline of a whole skeleton down his entire body. Some men devote their chests or backs to such ambitious scenes as the resurrection of Christ or the details of a shipwreck or a famous battle.

It is recorded that one woman a few years ago had her last will and testament tattooed on her back so that selfish or unscrupulous relatives would be unable to contest it . . . Who knows? —perhaps not only the beauty shop operators and the fox ranchers and the jailers, but also the lawyers will soon be studying the art of tattooing!

Model Speed Launch

(Continued from page 155)

tion on the other side of the driver. These wires should be quite stiff and insulated, although their protruding ends must be bare.

Seal in place with paraffin. Then melt more paraffin and pour over the bank of cells so that no water can get to them.

The deck pieces are sanded down from original blanks 1 inch thick. These are fastened in place with the screws shown, then sanded to shape. See that their edges meet those of the hull evenly. The small hatch is a glued-on bit of balsa 3 inches square which, in the model shown, covers a small hole through the deck piece which was necessarily cut to take the top of the motor.

The front edge of the stern deck piece is cut half round to form the cockpit in which the clothes pin driver-switch is situated. To complete the switch, run a stiff copper wire through the clothes pin top in such a manner that when it is turned in the hole bored to fit it, you either open or close the circuit, thus starting or stopping the motor.

Finally paint the boat in any two contrasty colors to suit. The keel is a bit of sheet lead cut as shown and so located as to cause the launch to ride on an even keel.

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Fortune Making Ideas for Inventors

(Continued from page 111)

4. Wanted—A Photo-Electric Camera

There has recently been introduced an exposure meter having as its principal part a photo-electric cell which, as the reader will recall, is sensitive to light and especially to actinic or short-wave light down near the violet and of the spectrum.

Now if a photo-electric cell can be made to gauge the amount of actinic light present, why cannot it be made to go one step further and operate the camera more perfectly than any human could do it?

The cell, working through a series of electric relays and switches could not only determine the correct exposure but it could also automatically adjust the stop on the camera and the result would be a most scientifically exposed picture with all of the guess work eliminated.

Such a contrivance would be a great boom for the moving picture industry, and less experienced men could then be employed for less money than a professional cameraman gets today. Indeed the problem has a number of rather alluring commercial advantages.

Specifications: A really button-operated camera—press the button and get a correct exposure. Should be the last word in automatic pictures and should not cost over one hundred dollars.

Exploitation: Should be sold outright to some large manufacturer of both still and moving picture cameras.

5. Glasses That Will Stay Put

One of the most needed inventions of the age and one that will bring untold wealth to the inventor is a pair of glasses that will "stay put." Glasses, to be of maximum usefulness, should remain adjusted in the manner they are left in when one emerges from the optician —but they don't and far from it.

Indeed, they are out of adjustment in less than a week in the average case. What we need is glasses that will automatically stay adjusted, leave no marks on the flesh and produce no discomfort in any way.

I admit that this is a really large order but the solution would certainly be more than worth the time and patience that would be put into it. Some new and better way is needed, and when I say **new** I mean it.

Specifications: The glasses, naturally, should not be freakish and the principle used should be inconspicuous. The cost of manufacture should not be any greater than the cost of the present glasses.

Exploitation: Should be patented in all of the large countries of the world and should be sold on the basis of a large down payment and royalty.

6. Electrically Welded Pipe Joints

Plumbers spend nearly half of their time threading pipe to take joints, elbows, tees and caps. If large buildings with steel frames can be erected by a process of welding, why cannot plumbers be provided with a special welding apparatus that will produce joints that will

Fortune-Making Ideas for Inventors

never leak. It would seem that welding would be much faster and certainly much more desirable than is threading, which eventually leaks and which takes a great deal of time.

Specifications: Outfit used should be portable so that plumbers may carry it with them. Not more than five minutes should be required to produce a perfectly welded joint and this should be done at an expenditure of not more than two kilo-watts of electric current. The outfit should be designed to sell for under three hundred dollars.

Exploitation: Should be patented in all of the countries of the world and should be sold on a royalty.

In conclusion, let me say again that you fellows will be darn wise to get to work right away on the inventions outlined above. And remember that I always stand ready to give you all the assistance I can in the way of information on developing, patenting and marketing your inventions.

Keep this in mind, though, when requesting advice. Do not send models, for I can't accept them, and you'll get them right back unopened. All that I need is a clear drawing, complete constructural data, and a stamped, self-addressed return envelope. Send your letters to me in care of Modern Mechanics and Inventions, 529 South 7th St., Minneapolis, Minn. So go to it.

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Of MODERN MECHANICS AND INVENTIONS, published monthly at Minneapolis, Minnesota, for April 1, 1932.

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Before me, a Notary Public in and for the State and County aforesaid, personally appeared S. F. Nelson, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the MODERN MECHANICS AND INVENTIONS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

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4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

S. F. NELSON,
Business Manager.

Sworn to and subscribed before me this 23rd day of March, 1932.
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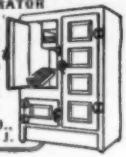

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Mounting Prize Catch Is Easy Job

(Continued from page 131)

need not be removed until you are ready to work on it at home.

Needless to state, the wooden form that you stretch the skin of your fish over must be right in dimensions with the length, girth and thickness of the fish throughout.

Knowing these figures a body can be carved on the spot if need be and thus shaped perfectly.

Two methods of body construction are illustrated in Fig. 5. In the first form the body is so made that the tail lies close to the panel. In the second form the tail flares out from the panel, giving the illusion of action on the part of the fish. Of the two the first specimen form is the easier to make.

When ready to draw the skin of the fish over the wooden body, a mixture of clay of the modeling sort is rubbed into the pits left by the fins, also in the hollow of the head and the cheeks of the fish. The skin is then fixed over the body, drawn down and tacked, the two edges meeting as shown in Fig. 6.

Unless the fins are now taken care of they will look unlifelike when they become dried. Fig. 7 shows how they should be attended to. Clip two pieces of isinglass to reach across the tail and put two pins into the filmy part to hold it in place against the board.

If the tail is to flare out from the board, spread the tail between the two pieces of isinglass and put clips to hold the tail in place as shown in Fig. 7. All the other fins are stretched the same way and isinglass pieces are used to hold the fins in place with wire clips to keep them erect.

The ventral fins (those on the central part of the belly) should stand at rest, lifelike. This illusion can be gained by driving a pin in from the fin into the wood, though not so as to show. The fin is then spread and fixed with the isinglass and clips as the other fins have been treated.

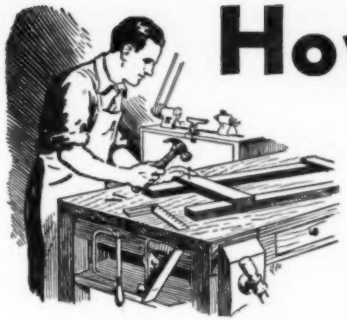
Unless the skin is stretched tight on the wooden form it will show ridges and irregularities when dry.

When the fish dries out, the colors fade and practically vanish. Artificial color must be used. However, the position of the stripes, reticulations and spottings can be readily made out and with a careful brush and thinned-out oil paint even the poorest amateur can obtain wonderful results.

It is necessary, of course, to know the colors your fish bore in life. In most cases you can find colored paintings in books of the various fish and can follow them, remembering always, however, to make them more subdued in color than the book paintings, which are mostly too vividly portrayed.

When the fish has been painted it is set away to dry for three or four days. It is then gone over with a good grade of varnish which is brushed on evenly, touching up all parts within reach of the eye. The varnish coat gives a striking brightness to the colors, making them look as though the fish had just been taken from the water.

For ordinary work the amateur will do well to use the oval shaped oak panel. The fish is arranged in the exact center, after which two or three screws are turned in from the back of the panel into the wooden form of the fish.



How-to-Build-It

Brand new—the 1932 Edition of HOW TO BUILD IT, the Home Craftsman's Manual! Crammed full of plans for building things in your home workshop — profusely illustrated with photographs, working drawings showing all dimensions, everything presented in blueprint form and explained in non-technical language.

HERE'S WHAT YOU GET:

BOATS—Plans for Gannet, a 24-foot cruiser powered by a converted Ford motor; plenty of room for two to sleep in Gannet's cabin, and she'll take you anywhere. Then there's the Tin Can-oe—built from a sheet of galvanized iron for the youngsters; non-sinkable.

TELEVISION receiver built from a fan motor. Also a beginner's radio broadcast receiver which can be built for three dollars. Also the Robbins Long Distance low-power transmitter, just the thing for talking with fellow amateurs over great distances.

HOME-BUILT AUTOS—several of them, one an outboard motor car which does 40 miles an hour. Also a rubber band flivver, and the M M Speedster Body for Ford chassis.

ICE YACHTS—Two of them: Scissorbill, a sail power boat which will carry half a dozen passengers with ease, and a high-speed Ice Zipper for two, powered by a motorcycle engine.

GYMNASIUM for the attic or basement, built up out of pipe and a few scrap pieces of rope and lumber. Also a back yard playground for the children—swings, wading pools, teeter-totters, etc.

FURNITURE FOR THE HOME—Portable pool table, electric fireplace heater, cigarette stand and novelty ash trays, violet ray health lamp, cigar lighter, grandfather's clock, book stands, etc.

WORKSHOP TOOLS—Toys—air rifle shooting gallery—diving helmet from a water heater—model boats—compressed air fire engine shoots real stream of water—duck decoys—electric eye opens garage door—and hundreds of others.

On Sale Today at Your Nearest News Stand—Price 50c

If your news dealer is sold out, send 50 cents to Fawcett Publications, Inc., 529 S. Seventh St., Minneapolis, Minn., and a copy of the 1932 HOW TO BUILD IT will be sent you at once.

HERE'S HOW IT IS PRESENTED:

Each article is written by an expert in his line, whether it's radio, boat design, or workshop practice.

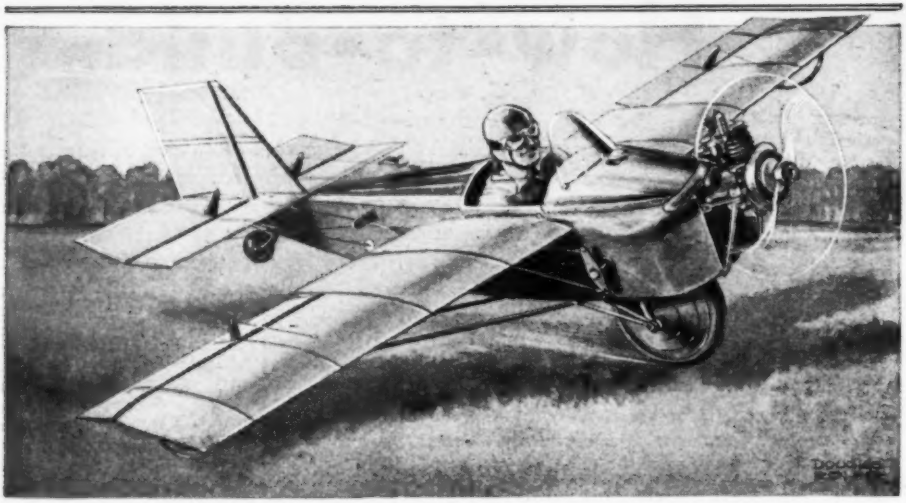
Every design described is accompanied by drawings or photographs (usually both) showing the step-by-step process of building. Drawings are all clearly done, with dimensions lettered in and all parts clearly pointed out.

Text matter is simply written—no fol-de-rols; tells you all you want to know and then stops.

HOW TO BUILD IT has a stiff paper cover that will resist wear and tear in the workshop. The book is the same page size as Modern Mechanics and Inventions.

The news dealer from whom you bought this magazine will gladly let you examine a copy of the 1932 HOW TO BUILD IT—that's the best way to get a clear idea of the good cargo it contains.

Look for this cover:



IT'S OUT - - The NEW 1932 EDITION of the

Flying and Glider Manual

YOU'VE been waiting patiently for it for months—and here it is, bigger and better than ever—by long odds the most up-to-the-minute and practically valuable edition of the Flying and Glider Manual ever published. The Penguin Practice Plane, shown at the top of this page, teaches the art of flying and supplies most of the thrills without leaving the ground. Plans for it appear complete in the 1932 Manual, as well as plans for a Ford-Powered monoplane carrying two passengers, which you can build for less than $500—and there are a dozen other plans in the volume.

Nowhere else will you find plans like these—authoritative, complete, lavishly illustrated with photographs and working drawings which make it easy to build your own airplane. Pick any one of the half dozen ships in the Manual and start to build it from the plans in the book—all you'll need will be tools, materials and a workshop; the Manual supplies everything you need in the way of plans and instructions. No use delaying—get your copy NOW!

PARTIAL LIST OF CONTENTS

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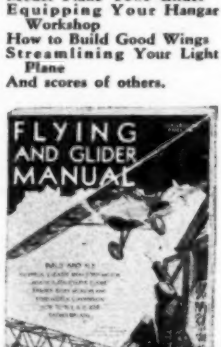
Plans for the P-H Biplane Racer
How to Build the Heath Super-Soarer Glider
Lessons in Glider Flying
Plans for a Penguin Practice Plane—motorcycle-engine ship for boys; does not take off the ground
Model Plane Tows Glider
Equipping Your Hangar Workshop
How to Build Good Wings
Streamlining Your Light Plane
And scores of others.



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Through Failure of the

DANGER GLAND*

That Wrecks Men After 40!

...yet This Little Book Might Have Saved Him Years of Needless Pain!

DEEP in the body of every man lies a tiny gland—the prostate. Every year, in thousands of men, this gland becomes so seriously swollen and inflamed that the victims, who should be vigorous, healthy men, become physical wrecks. Pains in the back and legs—peculiar headaches they can't account for—frequent need to get up at night all warn them that something is the matter. Yet they fail to heed. They think the night rising is a symptom of "bladder trouble" or "a sign of advancing age."

Competent medical authority says that 65% of all men past a certain age suffer from these symptoms—are actively victimized to some degree by this gland. Thousands of men who have finished their working years expect to finish their days easily and pleasantly. Instead, due to prostate ravages, they end their lives in misery. Thousands more aren't even allowed to retire—the murderous onset of this gland failure wrecks their earning power, and they end their shortened lives not only in ill health but in poverty. Millions more, if they are not actually sick, are harassed and kept about half-alive by the nagging, annoying symptoms of prostate weakness.

Yet a hundred thousand men today who heeded these warnings and learned the truth about this danger gland, have found a way to end those painful, sometimes embarrassing warning symptoms and prevent the disaster which threatens them. Through a clearly written little book, filled full of sound facts which every man over forty should have, they have learned how a great scientific discovery can now be employed—for the purpose of preserving health and strength, in many cases to prolong life, by curbing the ravages of this murderous little gland. Thousands upon thousands have written, in gratitude—have told us amazing stories of restored health and happiness, saying, "Use my name as a reference to save other sufferers as you saved me."

Of course, we can't publish all those names here—not one-tenth of them could we put on this page. But we can, and we **will**—send you the book which showed them the facts about prostate weakness, and the facts about Thermalaid, as this easy, drugless gland stimulation is called.

Mail the coupon today for your copy of "Why Many Men Are Old at 40," the volume which has showed 100,000 men over forty how to attack this painful and murderous gland failure. It presents the facts and the symptoms—clearly and intelligently, collected carefully from the observations of the world's greatest specialists on this subject. Find out from this book now—don't wait for the sick gland to tell you the details in a more unpleasant fashion. Simply mail the coupon.

*Prostate

The prostate gland lies right at the neck of the bladder. In men over forty it is easy for this tiny gland to get swollen and inflamed. As it swells, it partially prevents the bladder from emptying itself. Nerves are deadened; poisons accumulate. If not relieved early, it may even cause gland operation of the most dangerous sort.

W. J. Kirk, President.

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An item in the Kansas City Star says, "At a demonstration at the Kansas City Airport a newspaper was read at a distance of more than 1,000 feet in front of the light. The ground in front of the light for this distance was well illuminated but the rays were not projected higher than eighteen inches above the ground." No wonder it was awarded the grand prize and two gold medals in world competition.

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